50% Over-load!

ONE of our Sales Engineers recently sent in the following report on a customer who recently put a new air compressor on the market—

"Our customer had made a test on his line of 6 cu. ft. compressors and found our motors to be carrying a 50% over-load. He thought we had a special winding in this particular rating."

Our reply was—

"August 23, 1929

"We understand from your sales report of August 16, that the.....Company has made a test on his 6 cu. ft. compressor and found our motors to be carrying a 50% over-load and that he, therefore, believes there is a special winding in this motor.

"The ½, ¾ and 1 h. p. motors which we are supplying to your customer are all standard construction in every way.

The Master Electric Company."

Continuous 50% over-load is positive abuse for any motor and we did not nor would not recommend this particular installation. This is just one of the many times that Master Motors have proven their unusual ability to take abuse, if they have to, and stay on the job. And, the stamina of Master Motors is just one of the reasons for the complete satisfaction of those who use them.

Our facilities are at your service in helping you obtain proper motor installations.

Note:—If you are interested in obtaining the name of the customer which has been omitted in this message, we shall gladly give it to you.

THE MASTER ELECTRIC COMPANY
Dayton, Ohio
Manufacturers of Master Guaranteed Motors

STOCKS CARRIED IN PRINCIPAL CITIES
1/20 TO 10 H.P.
Dayton THE MASTER ELECTRIC CO. Ohio
MORE THAN 100 SERVICE STATIONS
NOT MORE THAN 40°

THE punch presses and other fabricating equipment at the Formica plant turn out millions of small parts daily. Some of these are for radio, some for automobile ignition systems - - - - and in fact for electrical products of all types. Some of them have to be very accurately made to close limits.

The machine operators work constantly on just one material - - and learn how to handle it rapidly and well.

The assistance of the Formica organization is always available to help manufacturers who do their own fabricating establish the best methods.

THE FORMICA INSULATION COMPANY
4638 Spring Grove Avenue CINCINNATI, OHIO

FORMICA

Electrical Manufacturing

Reg. U. S. Patent Office

Volume 4 | OCTOBER, 1929 | Number 4

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ELECTRICAL MANUFACTURING'S editorial program has the following objectives:

Production

To help all electrical manufacturers, including makers of motor-driven products, increase the product's salability, cut unit production costs, quicken turnover, reduce overhead expenses, establish standard methods of work, and spread a better knowledge of raw materials and parts.

Marketing

To spread a better knowledge of and aid electrical manufacturers in adjusting sales management to the buyers' market, to aid in making advertising more effective, finding the most profitable distribution channels, and promoting cooperative market development.

Administration

To further the working out of sounder management policies and better executive control, coordinating sales and production schedules, promoting research, and developing better industry relations.

Repairing

To help all motor repair shops to build better business by developing a sounder organization, improving management, policies and methods, and developing a keener merchandising point-of-view on the business.

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REMOVING THE FACTOR OF RUST

WHEREVER you find metal at grips with the enemy—corrosion, you'll find Udylite spreading its silver film of protection. This rustproofing process does its bit every day in safeguarding the fragile joints of the airplane, the vitals of the automobile and the rushing speed-boat. It also protects the flow of light and power in hundreds of high voltage sub-stations throughout the country. In fact, where the going is rough, the product exposed and susceptible to corrosion—there you'll find Udylite.

The use of the Udylite process means years of reliable, flawless iron or steel. Beauty on the surface—protection underneath, is an admirable combination.

NOT A PRODUCT . . . BUT A PROCESS

Udylite
RUST PROOFS
REG. U S PAT OFF

The UDYLITE PROCESS COMPANY

Eastern Sales Office:
30 East 42nd St., New York

3220 Bellevue Avenue
DETROIT, MICH.

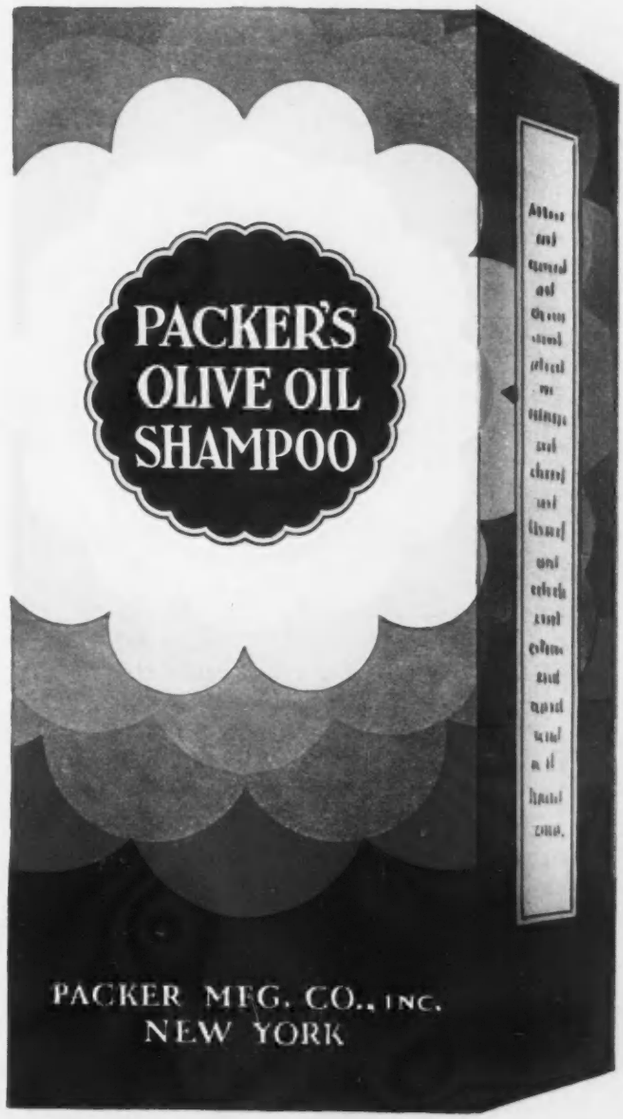
Western Sales Office:
114 Sansome St., San Francisco, Cal.

GAIR FOLDING CARTONS

To see a Gair Folding Carton is to Remember—that is the object of the aesthetic end of our business. That is also the aim of our practical printers and lithographers. They give the Carton living resemblance to the artist's shrewd, decorative scheme.

Business is raised upon the expectation of permanence. The beautiful, but faddistic tendency of an artist's brush can raise havoc with the life of your merchandise on the market. Your Carton must be so designed that it will be fashionable on the retailer's shelf in 1940—maybe later.

Our artists design scanning the future. They are also expert in revising old laggard Carton designs that are hopelessly betraying their trust. These artists have the knack of doing it without disturbing the Carton's trade identity.



Structurally, Gair Folding Cartons harmonize with every kind of automatic filling machine. Nothing notable about that—but far-seeing care and long practice have brought improvements to the surface that ensure high-speed and low waste averages in the operation of Gair Cartons. That's the exception.

Multiple dies for cutting and creasing Cartons were introduced by Robert Gair on April 17, 1868—sixty-one years ago. The history of modern merchandising began then.

Multiple dies initiated volume production, but the manipulation of their keen and dull blades never ceased to be a fine art. The guildmaster's touch still prevails in our Die Department. These artisans have the sureness of experience. Theirs is the record of years. One has just celebrated his fiftieth year in our service.

ROBERT GAIR COMPANY
420 LEXINGTON AVENUE, NEW YORK

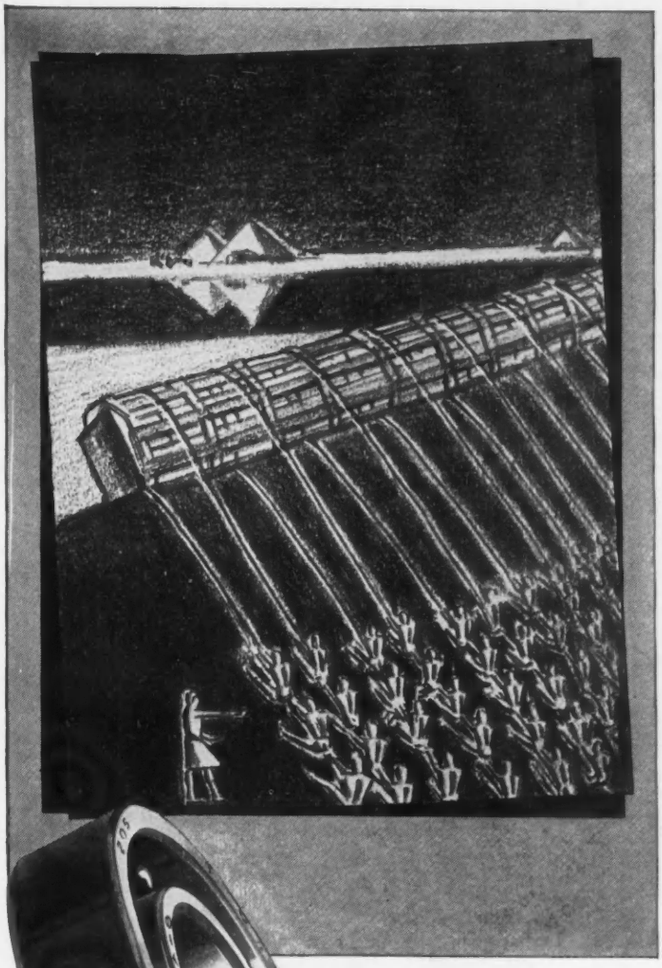
GAIR CORRUGATED SHIPPING CASES

GAIR Tan-brown Corrugated Cases have the vigor of color, structure and display that brighten the face of rough utility.

The Shipping Carton has a right to the artistic touch that gives personality to the Folding Boxes and Labels which cloak the merchandise inside. The strokes are bolder, nevertheless artistic.

Gair Corrugated Cases are made full weight, test and gauge. They will stand more crushing than Containers of the pallid, gray-complexioned tribe.

ROBERT GAIR COMPANY
420 LEXINGTON AVENUE, NEW YORK



The WORLD FIGHTS FRICTION

OESTIPHON the Egyptian watched a mob of tugging, pushing slaves proceed slowly along the valley of the Nile with a huge block of quarried stone. Even though a succession of rollers was dropped on the specially lubricated ground the labor was man-killing. Slaves were easily replaced, so the idea that came to Oestiphon, of a huge cylinder in which the object to be transported was placed, probably was in the interest of speed. The idea found favor with the then fair ruler of Egypt, and Cleopatra's Needle, now adorning Central Park, New York, was carried in this fashion to its original site. So this relic which benefited by early attempts to overcome friction now stands in a city whose mechanisms defeat friction with the modern device of ball bearings.

YOUR interest in the performance of ball bearings is based primarily upon the demands of users of your machines. Then select Torrington Ball Bearings.

They bar the way to friction, which otherwise would slow up the operation of the machine, and the enthusiasm of the user. Torrington Ball Bearings are accurate, like a watch . . . made from fine materials, of the standard of sterling.

DISTRICT SALES REPRESENTATIVES

S. W. ANDERSON
565 W. Washington Blvd.
Chicago, Ill.

The TORRINGTON COMPANY
Curtis Building
2842 W. Grand Boulevard
Detroit, Mich.

TORRINGTON TENSION NIPPLE SPOKES build wheels noted for beauty, uniform tension, strength and adjustability. Readers of the Saturday Evening Post are being told to "Look for the Nipple!"

The Torrington Company
ESTABLISHED 1866
Torrington, Conn., U.S.A.

. . . . further proof

THIS new factory is entirely devoted to the development, engineering and manufacture of Chromalox heating units, and their proper application to commercial and industrial heating problems. This partial list of appliances and heating devices convincingly shows the trend of leading manufacturers towards adopting Chromalox embedded type units. Today, more than 100 electrical manufacturers are making their products trouble-free by standardizing on patented Chromalox units.

Air Heaters, for residences
Air Heaters, Industrial
Bath Cabinets
Bakery Equipment
Beauty Parlor Appliances
Burning Brands
Coffee Urns
Clothes Dryers
Dining Cars
Doughnut Machines
Food Warmers
Glue Pots
Health Lamps
Hospital Equipment
Hotel and Restaurant Equip.
Ironers, Dom. & Commercial
Irons, Automatic & Non-Auto.
Incubators & Brooders
Metal Pots
Ovens, Drying & Baking
Pancake Bakers
Percolators
Popcorn & Nut Machines
Ranges, Domestic & Hotel
Sandwich Toasters
Siphonators
Waffle Irons
Waffle Bakers
Water Heaters, Domestic
Water Heaters, Poultry

that the industry is turning to the ★embedded type *heating unit*

as best represented in the Chromalox line of heating units

More and more the appliance industry is definitely turning to the embedded type Chromalox element for the solution of its heating problems.

The reason is obvious. The superior Chromalox construction makes it possible for these patented units to stand up under very severe usage. They have more inherent strength both structurally and electrically.

If you are in any way interested in the heating appliance field, here, point by point, are the exclusive Chromalox advantages which you should know about.

1. BUILT TO WITHSTAND OVERVOLTAGE and resulting overwattage, Chromalox units invariably eliminate usual trouble caused by voltage fluctuations.

2. HIGHLY EFFICIENT HEAT DISSIPATION due to refractory being compacted so hard under hydraulic pressure and baked at red heat. Heat transfer comparable to that of iron.

3. UNEFFECTED BY SEVERE ABUSE AND VIBRATION as proven by outstanding success in railway car heating. Over 150,000 Chromalox strip heaters now heating cars on 120 railways—the toughest kind of work!

4. MAXIMUM DEGREE OF UNIFORMITY IN MANUFACTURE. Chromalox units, manufactured on a standardized production basis, are made possible only through the Chromalox process and the use of Chromalox equipment.

5. HIGH INSULATING VALUE OF REFRACTORY —improves with age and use, whereas other forms depreciate.

6. BAKED AT RED HEAT after the resistor is embedded in it, Chromalox refractory will not absorb moisture.

7. HEAT DISTRIBUTION CAN BE VARIED to meet special requirements with maximum safety from local deterioration.

8. CHROMALOX ARE NOT THE CHEAPEST UNITS from cost per unit. But they are the cheapest unit from service-hour cost due to their unusually long operating performance.

★*having the resistor embedded in refractory material under hydraulic pressure and baked at red heat.*

★Chromalox
ELECTRIC HEATING UNITS

Manufactured Exclusively by Edwin L. Wiegand Company, 7500 Thomas Boulevard, Pittsburgh, Pa.

SOLE LICENSEES: Canadian Chromalox Co.,.Ltd., Toronto, Canada ABROAD: Geo. Bray Co., Leeds, England

HORSE HEAD

(Uniform Quality)

ZINC

For The
Die Casting
Industry.

Beauty Rides The Radiator

Symbolic of graceful body, powerful motor, flashing wheels, is the glamorous figure head which adorns the modern high way cruiser, the automobile. Beauty rides in every curve.

Symbolic of die casting craftsmanship and ingenuity are these bits of beauty which crown the modern motor car. And these die castings are produced in numbers and in speed compatible with automotive methods of production.

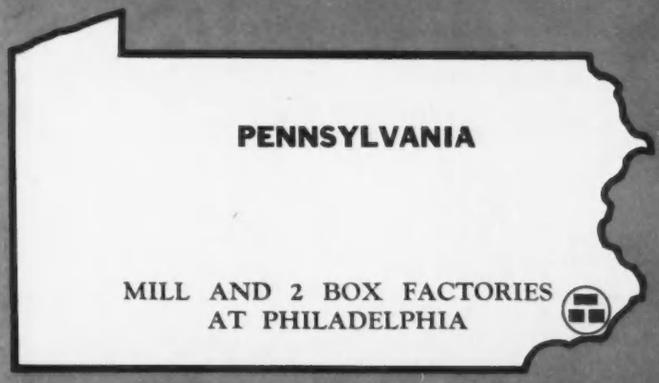
Horse Head Zinc—*uniform quality zinc*— is the base of these die castings. The plating properties of alloys based on this metal are favorable to any type of finish. Horse Head Zinc's marked suitably for all die casting problems make it the leading metal for zinc base die casting alloys; the symbol of the best in die casting progress.

The New Jersey Zinc Company

160 Front Street, New York City

ZINC METALS AND ALLOYS + ROLLED ZINC + ZINC PIGMENTS + SULPHURIC ACID + SPIEGELEISEN

Our largest plant, at Philadelphia, Pa., (Manayunk) where superior quality corrugated and solid fibre shipping containers, and boxboards, are made.



THE HOME OF DEPENDABLE CORRUGATED *and* SOLID FIBRE SHIPPING CONTAINERS *and* BOXBOARDS

[Exhibit No. 5 of a Series]

BOX FACTORIES *and* MILLS

(Corrugated, Solid Fibre and Boxboard)

of the

CONTAINER CORPORATION OF AMERICA

and MID-WEST BOX COMPANY

in PENNSYLVANIA

OUR plant group at Manayunk, a suburb of Philadelphia, is the largest and most prolific in variety of products of the eighteen factories and mills comprising the Container Corporation of America set up at this time.

Two large box factories and one big capacity mill are here busily engaged in producing highest quality corrugated and solid fibre shipping containers and a complete line of boxboards and paper board specialties. This plant furnishes these products to Pennsylvania, New York, New Jersey, Maryland, Delaware, District of Columbia, Virginia, North Carolina and New England States.

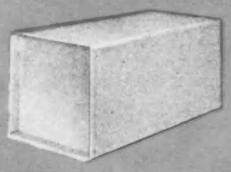
A central location, ample transportation facilities and very complete modern equipment which insure quick service and delivery of orders are advantages that customers will appreciate.

OTHER BOX FACTORIES

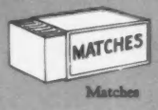
at Natick, Mass., and Bridgeport, Conn. will be shown in our next insert. Other units at Chicago, Anderson, Ind., Kokomo, Ind., Circleville, O., Cleveland, Cincinnati, Fairmont, W. Va. and Charleston, W. Va.

HAVE BEEN FEATURED IN PREVIOUS INSERTS

A Great Variety of Goods — Fragile, Solid *and* Liquid Now Packed in Fibre Board Containers



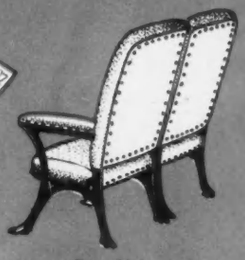
Pilferproof Recessed End Shipping Box



Matches

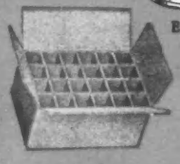
Shoes

Tobacco, Cigars Cigarettes



Opera Chairs

Everything in Cans



Reshipping Case for Bottles and Bottled Goods

Toys — All Kinds

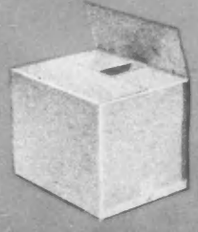
Lamp Wrappers

Electric Light Bulbs

Dry Cell Batteries

Soaps, Washing Powders and Flakes

Milk, Preserves, Etc.



Slotted Carton for all Commodities

We Make a Complete Line of Boxes for Air Express

AIR express is now operated as an auxiliary to the railroad express service, and every shipper should avail himself of the air service when speed is important.

Write us a description of the goods you wish to ship by air express and we will prescribe the correct design of box that will meet regulations and carry the commodity safely. Many shippers will want to be among the pioneer users of this new service and we will welcome every opportunity to provide correct designs of corrugated fibreboard boxes for such shipments.

If you have difficult shipping problems—fill in and mail to us the COUPON shown below.

Some Industries Now Using Our Solid Fibre or Corrugated Boxes

Bakery Goods	Furniture	Shoes
Canners	Stationery	Breakfast Foods
Building Material	Lamps and Shades	Proprietary Remedies
Sporting Goods	Tobacco—all forms	Spices
Books and Magazines	Perfumery	Foods—All Kinds
Toys	Paints and Varnishes	Instruments
Crockery	Automotive	Brooms, Brushes, Etc.
Bottlers	Glassware	Ceramics
Fruit Packing	Insecticides	Leather Goods
Radio Goods	Rubber Goods	Doors
Pictures	Electrical Goods	Hardware
Vegetable Growers	Men's, Women's and Children's Furnishings	Dry Cell Batteries
Meat Packing	Millinery	Enamelware
Dairy Goods	Confectionery	Filing Cabinets
Soaps and Chips and Washing Powders	Carpets and Rugs	Electric Light Bulbs
Matches		

CONTAINER CORPORATION OF AMERICA

and MID-WEST BOX COMPANY

111 W. Washington Street **Chicago, Illinois**

Six Mills—Twelve Factories—Capacity over 1200 tons per day

RETURN COUPON

CONTAINER CORPORATION OF AMERICA
111 West Washington Street, Chicago

Gentlemen: Please have one of your experts check our present packing and shipping methods—without obligating us—for the purpose of reducing our costs if possible.

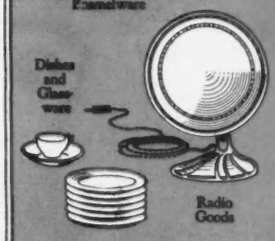
Name_____

Title_____

Firm_____

Address_____

Pottery and Enamelware

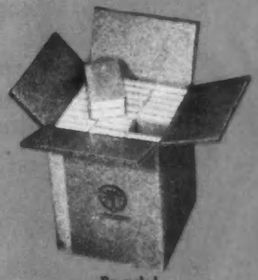


Dishes and Glassware

Radio Goods

Electrical Goods

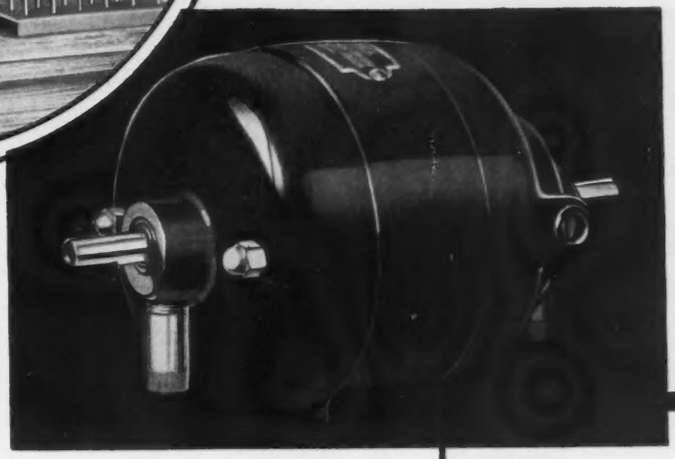
Reflectors



Enameled Tile

Wherever goods are manufactured — there you will find our boxes reducing packing and shipping costs.

THE INBUILT QUALITY OF DUMORE MOTORS



DELIVERS EXTRA SERVICE

BUYERS of Dumore Motors express a universal opinion commending Dumore quality. A quarter-century of highly satisfactory performance, in a great range of services, has inspired this confidence.

All Dumore Motor parts are of the finest material, produced to extremely close precision-standards. Careful assembly of parts by experienced motor-builders assures reliable construction. All unbalanced weight is detected and removed from Dumore Motors with a special machine of our own design. Motors dynamically balanced by this exclusive method run true, use less current, and are free from vibration and consequent bearing wear.

Of Dumore extra service, the International Register Company of Chicago says: "We have found that the Dumore possesses more power and life than the motors we formerly used." The Electric Window Company of Boston says: "Although motor dealers said it was impossible, The Dumore Company produced a universal motor that is very satisfactory for our special requirements."

To manufacturers whose products require small high-speed universal motors, the services of our Engineering and Sales Departments will prove a great asset. Write for further details.

DUMORE MOTORS

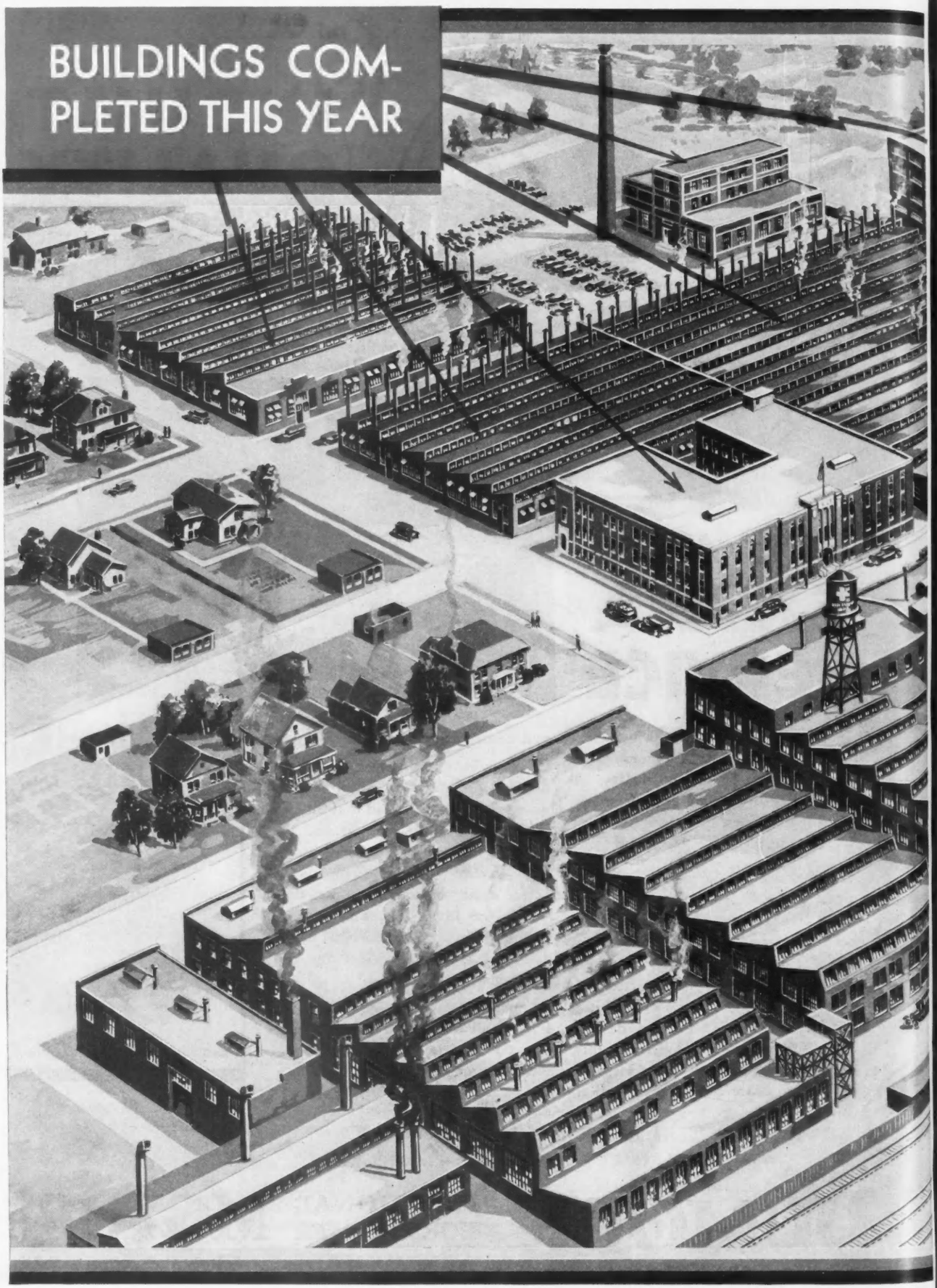
Are Used in

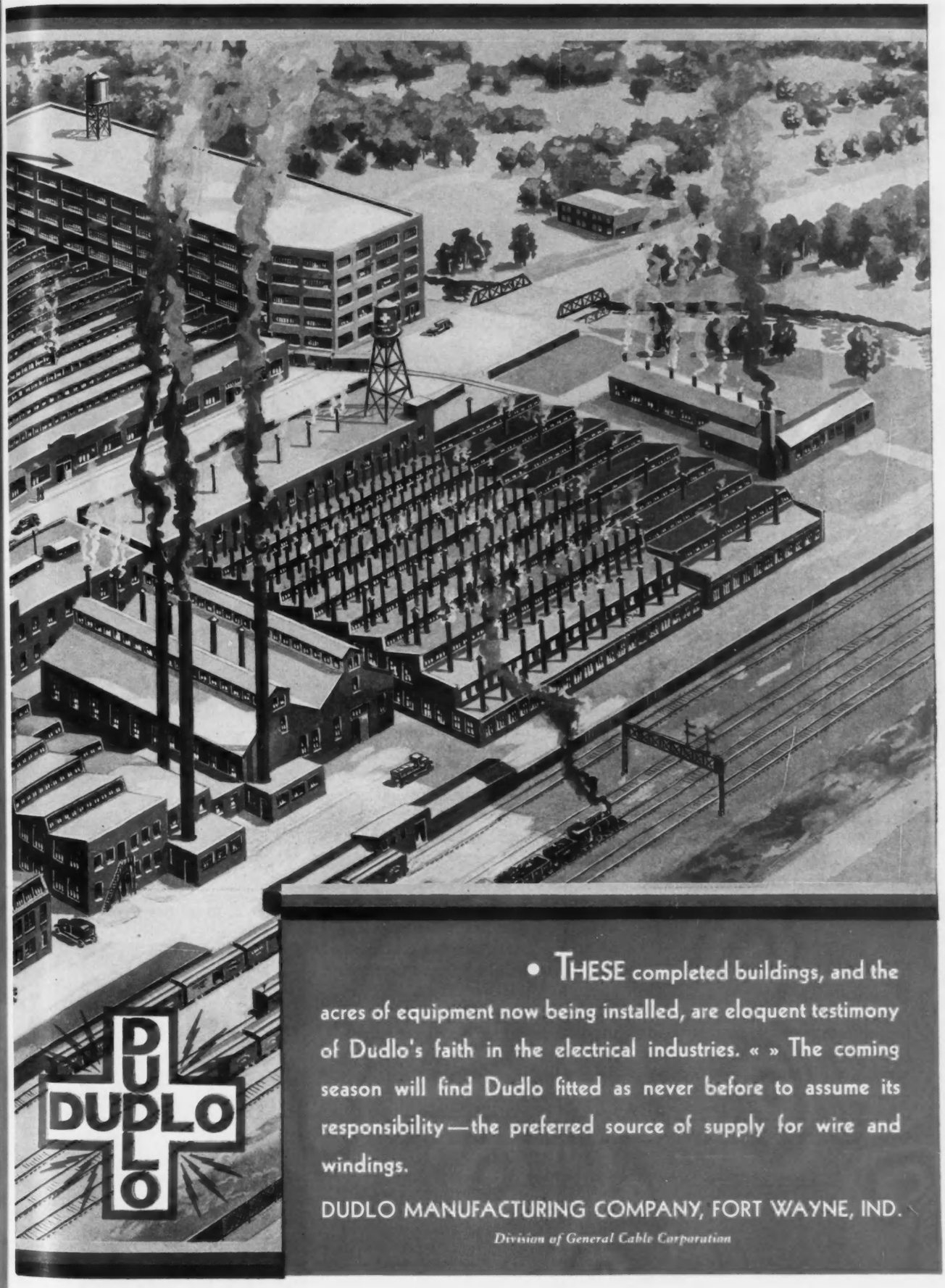
Floor Polishers
Vacuum Cleaners
Drink Mixers
Electric Grinders
Hair Driers
Air Compressors
Oil Burners
Bilge Pumps
Picture Projectors
Dental Engines
Routing Machines
Electric Drills
Electric Tools
Jewelers' Tools
and scores of other appliances.

THE DUMORE COMPANY
35 SIXTEENTH STREET RACINE, WIS.

TRADE MARK
DUMORE
REG. U. S. PAT. OFF.

FRACTIONAL HORSE POWER MOTORS ARE DYNAMICALLY BALANCED!


BUILDINGS COM-
PLETED THIS YEAR



• THESE completed buildings, and the acres of equipment now being installed, are eloquent testimony of Dudlo's faith in the electrical industries. « » The coming season will find Dudlo fitted as never before to assume its responsibility—the preferred source of supply for wire and windings.

DUDLO MANUFACTURING COMPANY, FORT WAYNE, IND.

Division of General Cable Corporation

CHROMIUM

~as 5th Avenue displays it..

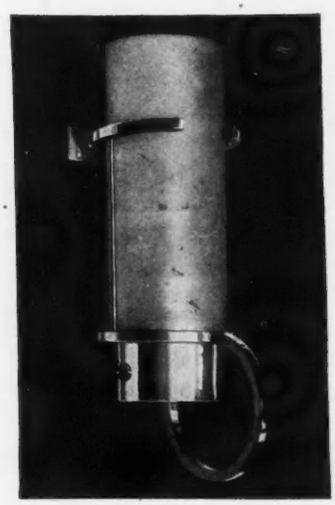
FURNITURE, decorations, electrical devices, lighting fixtures, personal items by the thousand — all Chromium Plated—are on display in dozens of shops on the avenue.

It is the utility of "U. C." Chromium Plate that has brought it from a laboratory curiosity into national demand. 5th Avenue is asking for more and more Chromium Plated merchandise. The progressive manufacturer and the most famous designers are cooperating.

United Chromium, Inc. is playing an important part, too. It renders a valuable licensing service which assures manufacturers of Chromium Plating on a definite production basis. It relieves them of uncertainty; guards them against failure and the losses due to rejects . . . The service includes the supervision of new plant installations; coaching of platers and control and maintenance of solutions by periodic tests.

It would be a pleasure to send details of our licensing service to manufacturers who contemplate using Chromium Plate on some of their products. Names of our jobbing licensees will be gladly sent to those whose present needs do not justify their own plating department.

Photographs by courtesy of Lord & Taylor, New York



UNITED CHROMIUM
INCORPORATED

Executive Office: 51 East 42nd Street, New York City

Chicago, Ill. • *Cleveland, O.* • *Detroit, Mich.* • *San Francisco, Calif.* • *Waterbury, Conn.*

Large Rugged **ENOUGH** To Wire To Last

EXACT SIZE OF THE NEW

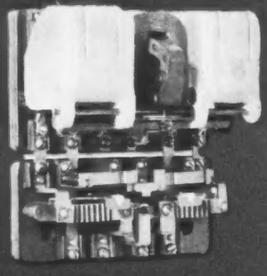
SUNDH ACLINESTOR

ACROSS THE LINE TYPE STARTER

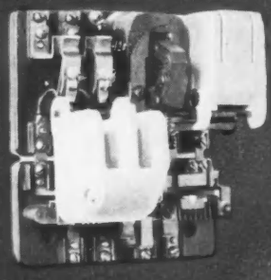
6013 Aclinestor Form M.A. full voltage automatic starter for remote control.

6013 Aclinestor Form M.C. full voltage automatic starter manual, automatic and off

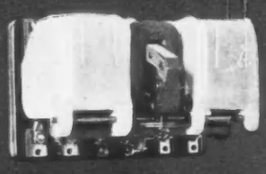
6013 Aclinestor Form M.C. full voltage automatic starter push button control.

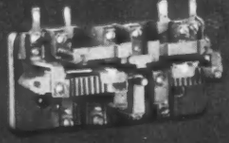


Interior of 6013 Aclinestor automatic push button switch. Note the simple, compact rugged construction, with ventilated arc-shields.



Switch above with arc-shield swung back for inspection of contacts. Switch or door cannot be closed in this position.





Switch and thermal relay are mounted on two separate cold molded bases.

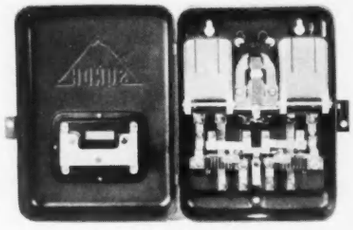
6013—the standard of comparison

Here is a switch by which all other starters can be compared. No testing is required. We have done that for you. It has been tested in air, in a salt bath, in a steam bath, for over load, for life of contacts, for every possible breakdown. We offer you this 6013 Aclinestor as a simple rugged dependable starter that has no superior. Price was not a consideration when we built 6013—it was built to the highest standard.

Note that there is plenty of room at top and bottom for wiring with plenty of knockouts. Also note that the connections go straight from line to load, that everything is compact yet not crowded, that start, stop and reset push buttons are straight through the box. No flexible leads.

Outstanding Features

1. Few moving parts.
2. Rugged construction throughout.
3. Famous Sundh quiet magnet.
4. No iron current carrying parts.
5. Cadinum plated parts throughout.
6. Contacts instantly removable by use of screw driver.
7. To remove coil, loosen 2 screws.
8. Ventilated arc shields of cold molded asbestos.
9. Bakelite molded contact support bar reinforced.
10. Switch and thermal relay on two separate cold molded bases.
11. Thermal overload reset from outside of box.
12. Switches complete in 3 and 4 poles.
13. Thermal overload adjustable for time interval.



Form M. C. Aclinestor with cover open.

14. Built to Underwriters' complete requirements.
15. Accessibility—coil—contacts and thermal relay elements instantly removable.
16. Push button recessed for protection.

Examine this 6013 Aclinestor

Only by examining this switch can you appreciate its superiority in design, construction and appearance. It meets every test and has interrupted stalled rotor current far in excess of its rated capacity. Ask us to send you a sample switch for inspection and trial.

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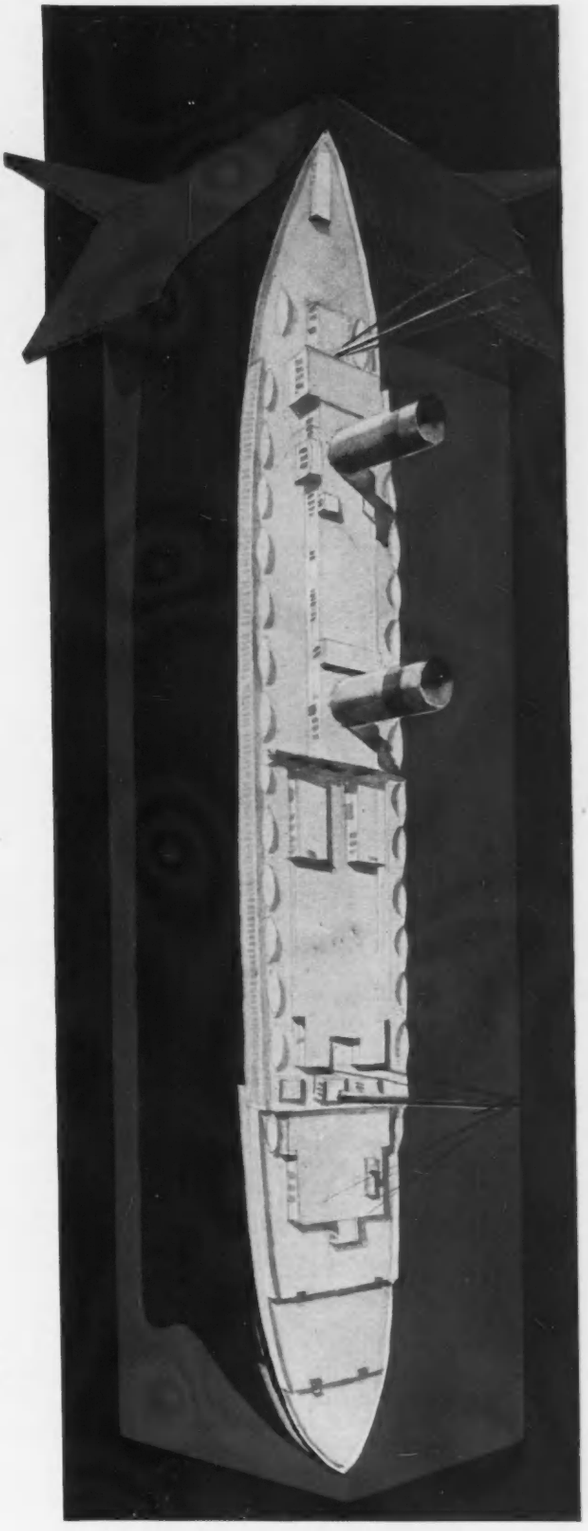
No. 5 Avenue C

NEWARK, NEW JERSEY

Sales Representatives in all Principal Cities

8 BREMENS

could be packed in one day's output of H & D products



IF ocean liners were shipped in boxes, eight steamships each the size of the Bremen could be packed in a single day's production of H & D corrugated fibre shipping boxes and packing materials.

This immense volume of production requires the services of 50 package designers who are constantly devising and improving corrugated fibre shipping boxes for practically every type of commodity. They have the resources of the world's largest corrugated fibre box making organization to draw upon. They are ready to serve *you* promptly, efficiently and effectively in answering your shipping box requirements.

H & D Package Engineers work with you at your request, without obligating you in the least.

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Bohnalite has high uniform hardness—great density—fine grained structure—unusual strength—excellent bearing qualities—ductility and lightness.

Many of the foremost American manufacturers use Bohnalite in huge volume.

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New York Chicago Philadelphia Cleveland Pittsburgh

ADAPT SHAKEPROOF TO YOUR PRODUCT

THERE are many places on many products where engineers are adapting the SHAKEPROOF principle. On this page four of these special applications are shown. There is probably a place on your product where SHAKEPROOF can save you time and money. We will be glad to work with you. Write our engineering department.

1. *Radio Locking Terminal.*

In the plant of a large radio manufacturer the SHAKEPROOF principle was applied as shown in the illustration. This terminal was designed with SHAKEPROOF thereby eliminating the use of two lock washers and also saving two extra operations.

2. *Knife Switch Spring Washer.*

Locking on a large knife switch is an important problem. This problem was successfully solved by one manufacturer by applying the SHAKEPROOF locking principle to the spring washer holding the knife switch in place. This washer is of bronze and its cupped shape forms a spring tension against the knife blade. The twisted teeth bite into the nut preventing its loosening.

3. *Outlet Box Lock Washer.*

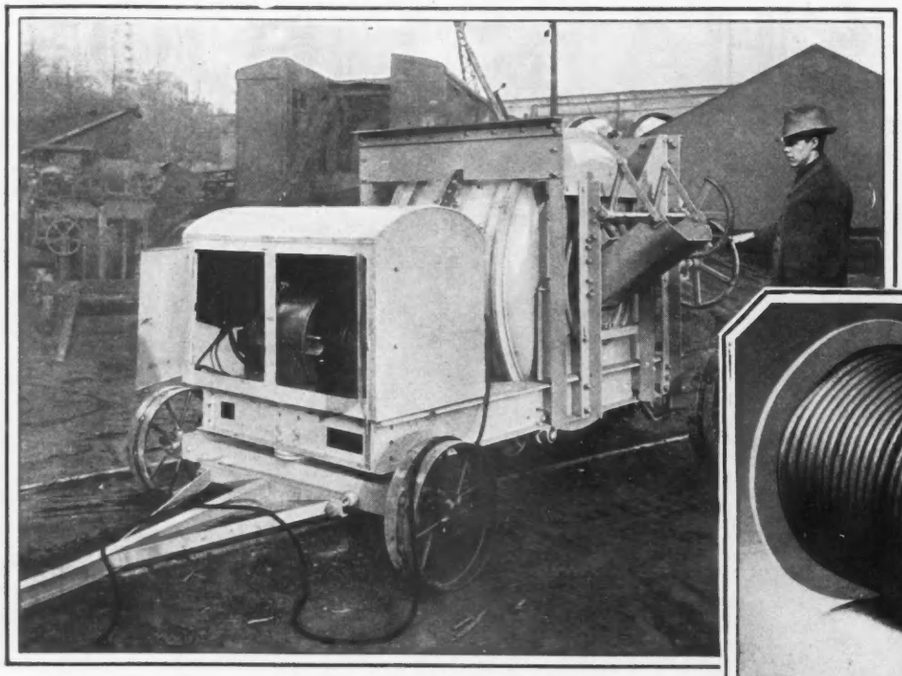
The SHAKEPROOF Lock Washer shown here is designed to replace the nut which fastens conduit or armored cable connections. It threads on to the connector and the twisted teeth bite into the metal of the box forming a permanent lock that is also a perfect ground.

4. *Shakeproof Switch Terminal.*

The constant loosening of the terminals in the automobile switch shown above caused the engineers to investigate the advantages of SHAKEPROOF. Twisted teeth were set around the inner circumference of the terminal and now when the terminal screw is tightened down against these teeth it forms a permanent lock which vibration cannot loosen.

SHAKEPROOF
Lock Washer Company
[Division of Illinois Tool Works]
2513 North Keeler Avenue Chicago, Illinois

U. S. Patents 1,419,564; 1,604,122; 1,697,954. Other Patents Pending. Foreign Patents.



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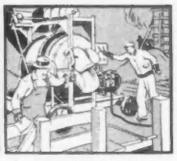
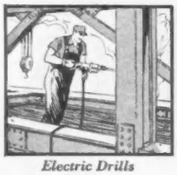
Lighting

Household Appliances


Construction Machinery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The superior rubber jacket around the heavy, flexible copper conductor in GE-Flex Cord withstands water, oil, acid and abuse. It does not kink or crack open.

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OCT 11 1929

Electrical Manufacturing

Production - Marketing - Administration - Repairing

Volume 4 OCTOBER - 1929 Number 4

That "Last Ounce" In Good Factory Control

WITH the pressure of competition that exists today, the manager of an electrical manufacturing plant is in the position of the juggler who keeps a number of Indian clubs circling in the air. Every club has to be tossed with continuous precision. If three clubs are well handled and the fourth is not under control, the whole act will fail.

Think of the four Indian clubs as Quality, Service, Cost, and Organization (or any other set of fundamental conditions which a manufacturer must meet) and you have a pretty fair picture of the need for well balanced management, and what happens if you haven't it.

Visit ten electrical manufacturing plants, and in eight of them you will find managers who are stronger in some phases of their job than in others. This is natural enough, of course. Just as it is natural for eight out of ten athletes to excel in a particular type of competition.

It is natural, but in manufacturing it is dangerous. Let the manager interested primarily in cost reduction neglect ever so little his quality or his service to customers and there is trouble ahead for him. Let the quality enthusiast be slow in his deliveries, and he too will have medicine to take. Or let either one become so absorbed in his quest for results that he becomes a trifle absent-minded about his relations with or control over the workers upon whom the results depend, and he will find his plans hampered at every step.

THIS company never asks the impossible of its organization, but it does set some good stiff "bogies." And what's more they are lived up to. There are bogies on quality, of course, on service to customer, on cost and even on some of the more unusual phases of employee performance.

The worst of it is that it doesn't take any serious one-sidedness to cause difficulties. Standards of management are constantly being raised by intensity of competition, and

once up they stay up. A few years ago one plant to which this magazine goes used to buy 25 per cent more material than actually went out in finished product. Today it operates within a range of 5 per cent. And manufacturers of radio tubes expect more than 99 per cent of their product to prove satisfactory to users—a standard that in years past would have been unbelievable.

The higher your efficiency, the more important it is to have all around management right up to the last ounce. If you happen to be in a branch of the electrical industry where not over 60 per cent of your customers insist on immediate delivery, one slow delivery in a hundred is not going to worry you. If, however, every customer expects promptness and knows that your competitor can be speedy if you can't, you may be making somewhere around 99 per cent of deliveries with all reasonable expedition. If you are, then a drop of one per cent in your records means, actually, that you are doubling your number of customers unsatisfactorily serviced.

They Sought a Measuring Stick

IT was the realization of the necessity for maintaining high standards in every fundamental of management that inspired H. D. Madden, Westinghouse Lamp Company's General Superintendent, to send a group of his executives to Atlantic City a few years ago, for an intensive three-day planning conference. Mr. Madden wanted a measuring stick for management: a monthly barometer that would indicate managerial "weather conditions" in each of several cornerstones of plant management. And he got it.

That Atlantic City conference has already saved many thousands of dollars to Westinghouse Lamp Company. The measuring stick which it developed has acted also as an alarm system which prevents a manager from getting one sided. More important still, it has also been the direct cause of a constant raising of management standards in Westinghouse Lamp plants.

Fortunately for other manufacturers, this method which Westinghouse Lamp has developed and given a three years' trial can be used in any manufacturing plant. In the Westinghouse case it is applied to eight plants. This adds a competitive flavor to its operations, but also increases the difficulties of establishing and administering it. A single plant, large or small, could use it equally well—provided the details were intelligently worked out to fit the individual case.

The essential elements of the scheme are five:

I. Choose the elements of management which it seems important to control.

II. Set up "bogeys" for each of these elements, and simple measurements whereby it may readily be determined, monthly, how close a plant has come to each bogey.

III. Report monthly on the plant's "score" in each element.

IV. Make it a real honor to achieve good all around performance, and plain as day when performance in any one particular is unsatisfactory.

V. Provide a monthly financial incentive for executives whose work may contribute to a high plant score.

Here's how some of the details of these five points have been worked out at Westinghouse. In each case it will be understood that the particulars fit Westinghouse conditions and might not fit conditions in any other organization. The principles, however, are universal.

I

Management problems were divided into four major groups, and rated for their relative importance.

Quality	30
Service	25
Cost	25
Personnel Control	20

"Quality" means quality of the product as determined by inspections. The work of the engineering department does not come under this measurement of operating management, which is concerned solely with the production departments.

"Service" means prompt delivery to customers.

"Cost" speaks for itself, and "Personnel Control" items are those employee-performance records which the management feels have an important bearing on quality, service, and cost results. Just what they are will be seen from the following description of bogeys that have been set.

II

In the incandescent lamp plant there are three different bogeys for Quality, representing three separate inspections. These are: Warehouse Inspection, Lamp Performance and Mazda Service.

The first two are Westinghouse Inspections, the third an impartial inspection by an outside agency. As the three differ in their nature, and cover various electrical and physical qualities, the three bogeys constitute a pretty stiff test—and an all around one.

The single bogey for service is known as, Customers' Orders.

Cost bogeys are four in number:

Material Efficiency

Expense vs. Budget (ratio of actual to budgeted Expense)

To make bogey each plant is allowed but one lateness in 10,000 *chances*

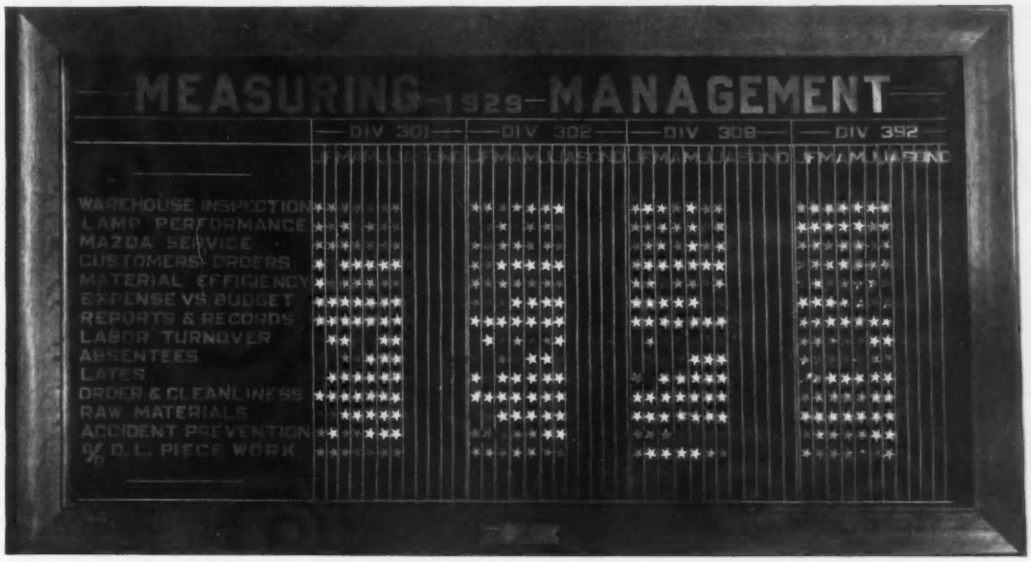
Raw Material Stock
Percentage of Day Labor to Piece Work.
Labor Efficiency.

Personnel Control items include:

Reports and Records (promptness and accuracy)
Labor turnover
Absentees
Lates
Order and Cleanliness
Accident Prevention.

The difference between the bogeys set for the lamp plants is the same whether the shipment is of 100 lamps or 1,000,000. The total number of points divided by the number of shipments gives the figure that must be compared with bogey.

The bogey for Material Efficiency is one which ought to lead to savings of many thousands of dollars in almost any electrical manufacturing plant. How much material is contained in each unit of finished product, as determined by the engineering department's designs and specifications? How much material is actually used? The ratio of one to the other is "material efficiency." Expressed as an equation, Westinghouse Lamp's bogey is:



Red stars indicate trouble. Blue stands for fair performance and white stars represent "lily white" accomplishment. Thus at a glance you have a measure of management

and those chosen for the plant which constructs special machinery for use in the other plants shows the flexibility and adaptability of the bogey idea. The machine plant uses only part of the bogeys already listed, and has four which will not be found in the list given for the lamp plants. These four are:

Work in process
Finished Parts Stock
Delivery vs. Schedule
Installation vs. Schedule.

Now what are all these bogeys like?

They differ considerably, and show considerable ingenuity in their working out. They are alike in that all are severe tests, based on the idea that while the impossible should never be asked, bogey should set the highest standard of performance which the previous experience of any one plant has indicated is possible.

Bogey for Customer's Orders is 98.5 out of a possible 100, against a standard of delivering all stock types of lamps within two days of receipt of order, and all nonstock items within ten days. But a record of 98 points actually means more than 98 per cent efficiency, because of the system of penalties which is used in the reckoning. Every shipment made within the two-day due date gives a plant a credit of one point. But for every shipment that goes out late there is a penalty: one point if shipment is within five days, five points if from six to ten days. This penalty

$$\frac{\text{Theoretical unit consumption x number of units produced}}{\text{Actual total consumption}} = 0.97$$

In other words, 97 per cent of all material purchased must find its way into finished product.

It is interesting to note that the company's ratio of material efficiency used to run about 80 per cent, but is currently around 95 to 96 per cent.

Another simple bogey that can mean a lot in dollars saved is that for Raw Material Stocks. Here the formula for the standard lamp plants is:

$$\frac{\text{Inventory (Dollars)}}{\text{Month's Consumption (Dollars)}} = 1.0$$

In other words, bogey is a twelve times turnover. For the special lamp plants it is less severe. The actual attainment of a number of the plants is from 0.9 to 0.7.

A similar formula cuts costs by serving as bogey for work-in-process investment in the machine division:

$$\frac{\text{Work in process}}{\text{Month's Billings}} = 2.5$$

Among Personnel Control items a remarkable bogey is that covering employees late to work. This bogey calls for 99.9 per cent of a perfect score. In other words, each plant is allowed but

(*Continued on page* 54)

Flow of Work in Radio

An explanation of the methods followed in the production of radio receivers, describing some of the more important operations and their relation to each other with respect to plant arrangement and the handling of parts and materials in process.

By T. O. ARMSTRONG
Westinghouse Electric & Mfg. Co.

THE RADIO INDUSTRY has become immense almost over night, and in this article one phase of the industry, production, is presented. At the East Springfield, Mass., works of the Westinghouse Electric and Manufacturing Company radios of all sizes are manufactured for the Radio Corporation of America.

The quality of a radio product, manufactured on a large scale, depends largely on systematic inspection and testing of purchased materials received, as well as inspection and test during the entire course of manufacture.

The materials when received at the Springfield plant are given, in most cases, a very thorough inspection. A few specific cases will serve to illustrate the extent to which the inspection and test of purchased materials is carried out.

An item used throughout a radio receiver, namely wire, is inspected to determine the quality of the insulation covering and the size of the copper wire, as well as the thickness of the insulation. Each size and type of wire must meet definite specifications before it will be accepted for use in manufacturing.

The filter and by-pass condensers used in receivers are manufactured in the principal Westinghouse plant at East Pittsburgh, Pa. And, even though they are put through thorough inspections and high voltage tests at that plant before shipment, the condensers are re-checked upon arrival at Springfield before they are used in production. They are checked primarily for opens, shorts and grounds, as well as for capacity.

Many detail items such as escutcheon plates, dial scales, resistors, grid leaks, knobs, etc., are rigidly inspected as they are received.

This is by no means the full extent to which the materials used in the production of a radio are checked when received. Such items as insulation varnishes and fabrics, phosphor bronze stock, filling compounds, transformer laminations and steel, and similar items, requiring more elaborate tests, are analyzed in the material and process engineering laboratory.

This laboratory is equipped to make any special tests and investigations of a mechanical as well as a chemical nature, definitely controlling the quality of such materials which cannot readily be controlled by the usual inspection methods.

Feeder sections of the plant, of course, play an important part in the manufacture of a radio, as stamped parts are made in them.

The shaft for the variable condensor assembly, is made in the screw machine section, the grooves in this shaft, being made in one operation with a multiple cutting tool for the accurate spacing of the condenser plate.

These plates are as near flat as is commercially possible

THROUGHOUT the entire sequence of operations in the production of radio receivers in the Westinghouse plant, at East Springfield, Mass., conveyors play a very important part and production facilities have been so arranged that they are correlated to each other. In the view at the top of this page may be seen a group of operators assembling transformer coils, while the view at the right shows inspection of the socket or power supply unit after it has been assembled

in a Modern PLANT

to make them, the grooves must be accurately spaced, this being done with the aid of a jig used for the assembly of the plates to the shaft, in which the accuracy of the component parts of the jig are held to tenths of thousandths of an inch, both radially and longitudinally.

The lead department manufactures and assembles the lead wires. These are comparable to the arteries and nerves of the human body through which currents pass, and the senses are brought to life. Much care and attention is given to preparing these leads for assembly as the wires must be properly stranded and of the right dimensions for the work required and the insulation must be up to requirements.

The wire is then cut to its proper length, the covering treated to prevent fraying, the end stripped of its insulation, when the wire is twisted and tinned with solder or terminals are applied if required. They are then inspected and laid out on assembly boards. This board made from the drawing is so marked that mistakes by the operators are avoided, as to lengths and color of lead. Each lead is put in its proper place so that its terminal end is in position for assembly in the set.

They are then laced together and where necessary, a covering is braided over by a braiding machine, after which they are ready for assembly in the set.

Frequently coils used in radio receivers require very careful matching in order to get the proper alignment of the circuits in the completed receiver. These coils are wound on specially constructed winding heads by girls. The machines are provided with a number of automatic devices, such as lead screws, winding fingers, markers, stops and dials, to insure the accurate and delicate spacing of the windings, so essential to the correct inductive value of the coil.

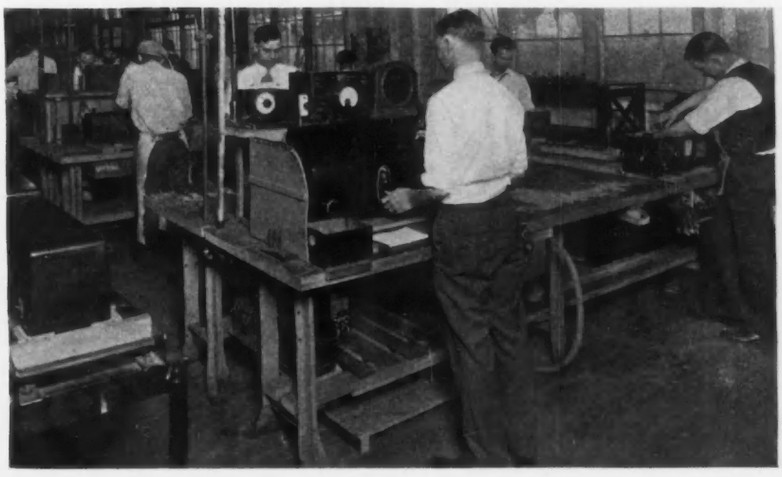
A radio frequency coil assembly consists of three coils wound on a piece of micarta tubing, all three being differently wound. The variance in inductance in a set of coils must never exceed ¼ of 1 per cent.

After the completion of winding, the coils are placed on trays upon the conveyor belt to be forwarded to the spraying section, where each coil is placed on a rotating chuck to be evenly sprayed with black lacquer to protect it against moisture and corrosion. From this process, they are carried on a conveyor to the scrapers, where the ends of the wires are cut to proper length, and the lacquer and enamel scraped off to a shining brightness on a wire wheel scraping machine to prepare them for soldering.

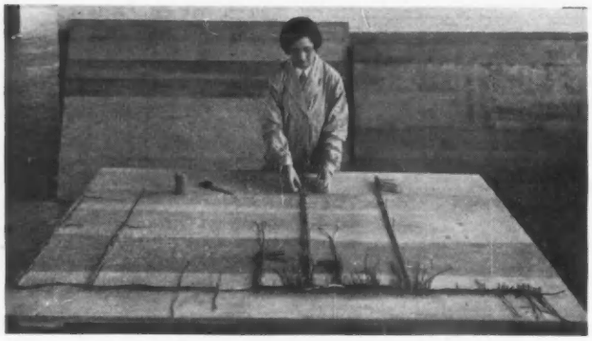
The last step of the mechanical process of the radio frequency coils is the assembly of the inside primary and its two connections to the proper terminals. Each coil is carefully inspected from a mechanical standpoint for proper soldering, location of windings and general appearance. Due to the extreme accuracy required in the manufacture of this coil, special equipment had to be developed. By the use of the Oscillograph as an indicator, the value of each coil is shown on a small calibrated screen which affords exceptional speed as well as accuracy in testing several thousand radio frequency coils each day.

The combination of a judicious use of conveyors, proper containers, proximity of machinery, along with modern machine equipment will be noted throughout. Radio components are manufactured in various sections or bays, and the parts assembled in an arrangement that brings the units together at one point for assembly in the completed radio receiver, ready for shipment.

In the assembly of the variable condenser, the plates received from the feeder sections are placed in a special fixture, which resembles the condenser



ON this page are two more views showing production methods. Notice that conveyors are highly important in practically every operation and that they eliminate much manual handling of parts and materials. At the top of this page is one of the chassis assembly lines. Notice the endless, power-driven belt conveyor between the two rows of operators. It carries practically all of the various parts to the assemblers. At the left is shown the method employed for testing and inspecting the complete radio



base. In this manner the condenser shaft is soldered on making the complete plate assembly. From this operation the assembly is placed in the base that is made in the punch press section by a drawing operation.

The completed assembly is next given a careful mechanical inspection, for spacing of plates, smoothness of control, adjustment of cable, tightness of screws and proper soldering. They are then tested for alignment and adjusted where necessary. Here again, the uni-control feature in the receiver requires very close accuracy in alignment of the three tuning condensers.

Each tuning condenser being adjusted for capacity to an accuracy of 1/2 of 1 per cent except on the low capacity end, where 5 mmf. variation is allowed. The ordinary beat oscillator scheme is used, whereby each tuning condenser is placed in the first circuit of an oscillator and the resonant point is found with respect to the second circuit of an oscillator.

The audio frequency coil consists of a primary and secondary winding. The primary winding is usually of wire of larger size than the secondary. Some of the finest sizes of copper known or used in the electrical industry are used in its manufacture. This is due to the large number of turns of wire necessary and the small amount of space into which they must be placed. This winding, that is, both the primary and secondary coils, is wound on automatic winding machines linked side by side and opposite each other along the room, between which a belt conveyor carries the finished work to the next operation. That is, of course, a coil with 0.00075-in. thick glassine paper between layers of wire, the paper being placed between the layers automatically. The only time the machine is stopped is when the coil is completely wound, or when the wire runs out on the spool.

The spindle speed of the primary winding machine is approximately 4000 r.p.m. while on the secondary it is 3200 r.p.m. which is a noticeable and remarkable feature in that the wire used is the approximate diameter of a human hair, consequently, it is necessary that the most skillful operators be placed on this work due to its delicate nature.

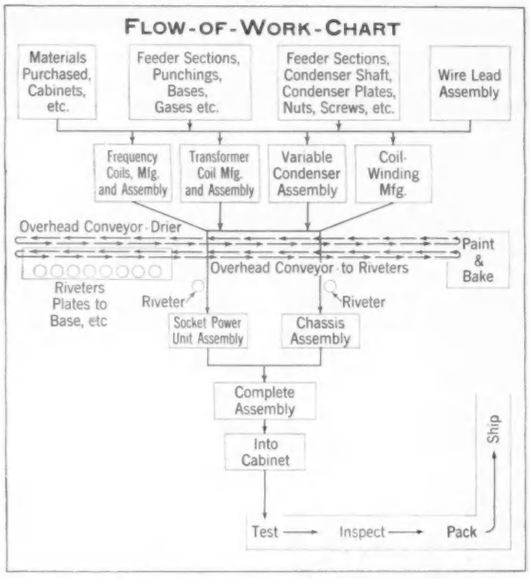
After the group of form coils leaves the winding machine, the coils are cut apart on a cutting machine of special design. Coils wound in this department vary from 1/2-in. in diameter to as large as five and six inches in diameter and are wound with as high as forty thousand turns.

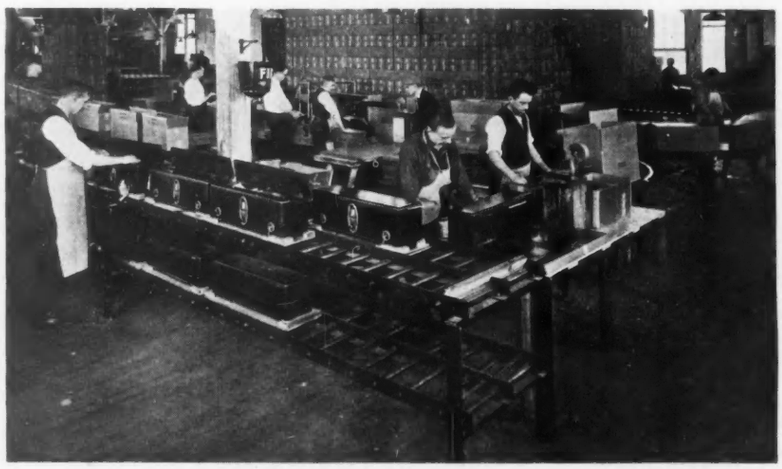
All reactor coils are of the universal type. Cotton is woven between layers of wire as an insulation, two coils being wound at one time on each machine, and while the machine is employed in putting on the number of required turns, the operator of each has a separate winding machine consisting of a motor, a spindle and a speed control attached, on which he connects the finished lead, anchors it and insulates the outside of the coil. These machines are run at a speed of approximately 1500 r.p.m.

Immediately after winding, the coils are tested for correct number of turns, shorts and open circuits. They are then built into a transformer and tested for inductance, open circuits and grounds, after which they are treated in an impregnating compound, assembled into the transformer case and are ready for assembly into the radio set.

The audio transformer is then attached and the chassis is again placed on the outer runway of the conveyor, passing by a group of riveters who take the chassis from the conveyor, rivet the tube panel in place, and place it on a small endless belt conveyor which conveys the part down the assembly line.

The assembly section is made up of three groups: supply power unit group, the chassis assembly group, and the





THE young lady in the illustration at the top of this page is assembling the various parts that go to make up the lead wires. In the center of the page is a chart that shows how carefully every operation is planned and how it is arranged in sequence with other production work. Everything functions in natural sequence from the time the raw materials are received until the finished products leave the plant. At the right is the shipping room, showing how the finished sets are examined for appearance before they are packed

final cabinet assembly group. On these assembly groups such operations as the assembling of the capacitor pack, attaching the rubber grommetts, soldering the various connections, attaching the frequency coil, the volume control and potentiometer. After each operation the operator places the part on the belt which conveys the assembly up through the group to the next operation.

At various points along the line of the assembly groups, each part or unit is inspected, it being essential throughout that all parts be in their proper places, and that all soldered joints are perfect.

The power transformer consists of a primary, secondary and filament winding. In some cases there are as many as six filament windings on one coil and on others there are but two. The primary and secondary windings are universal as mentioned in the preceding paragraph, while the filament is hand wound.

The coils are tested similar to the reactor coil except that they are tested between windings of 2500 volts, to insure the safe operation of them when assembled in the set.

A system of cooling the transformer after being filled with hot asphalt is used. This system consists of a tower with a conveyor chain installed which makes one complete revolution each hour.

A unique operation is in the assembly of the fixed condenser. Girl operators sit around a revolving table assembling a certain number of copper strips with a thickness of mica in order to acquire the desired capacity. After its assembly another operator sitting near the table clamps the assembly together on specially devised machines, from which the completed assembly is forwarded to the test section to be examined for shorts, and thence to another operator who tins and impregnates each end.

After the fixed condensers have been tinned and impregnated, they are again sorted in their various capacities. Each one is adjusted for capacity to an accuracy of 1/2 of 1 per cent except on the low capacity end, where 0.5 mmf. variation is allowed.

Visual testing equipment similar to that referred to in radio frequency coil testing is used in testing these condensers. They are then matched with the coil, for their assembly in the intermediate transformers.

After the major parts of the sub-assemblies have been completed a mechanical inspection is given all the work completed, with special emphasis on all soldered joints.

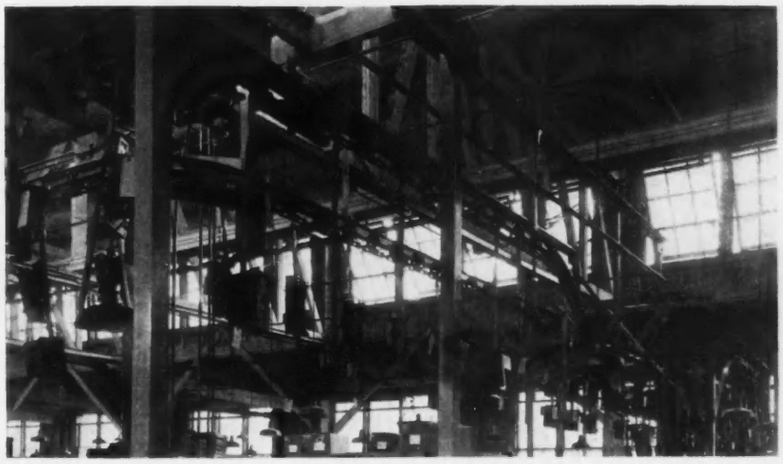
After the complete assembly of the chassis, it is put through a continuity of tests by use of special equipment. The chassis terminals are connected to clips and connections are made to the tube contacts by means of tube prong plugs. The manipulation of several switches and the reading of a meter indicate to the tester immediately any incorrect or open winding as well as the specific circuit.

The chassis is then passed to the next inspection operation where a thorough mechanical inspection is made of soldered joints, condenser action, volume contact action, proper location of all wiring, tightness of all screws and nuts and tube contact action. It then passes to the third test operation and is connected to a standard socket power unit where the tube is connected to the antenna, and the loud speaker terminals to the meter and loud speaker transfer wedges. Three oscillators covering the range of the receiver supply the signal to each dummy antenna so that each tester has control of the input signal of the receiver under test, calibrated in microvolts per meter. This arrangement provides a thorough test of the receiver by means of instruments rather than by ear, the loud speaker being used primarily as a ready means of tuning. The serial number of the set is then attached and the unit is ready for assembly into its cabinet.

The supply power unit, or the socket power unit, is another feature of assembly that is similar to the chassis assembly and runs along another endless belt conveyor parallel with the other. The base of this assembly is taken from the dipping and drying conveyor for the assembly of the various component parts such as the tube socket, terminal boards, transformers, reactors, capacitors, and resistance strips, and are assembled to this base on top and underneath, proceeding down the endless belt conveyor to the various soldering operations. It is essential that all soldered joints must be neat and complete. At the end of this belt conveyor the socket power unit is sprayed and dried.

The socket power unit is then tested, the test equipment being arranged so that the unit can be placed quickly into

(Continued on page 70)



AT the top of the page is a view of the department in which variable condensers are assembled and tested. Notice again the use of conveyors for handling materials. Many other interesting applications of mechanical handling equipment are to be found in the Westinghouse plant. In one case a conveyor is employed to dry and cool radio parts after their impregnation, making one complete revolution in an hour. At the left is one of the large overhead monorail conveyors that is used for handling heavier parts, such as the chassis

FLEXIBLE CORD STANDARDS ADOPTED BY NEMA

In its efforts to eliminate substandard materials Nema and the Underwriters' Laboratories have approved certain standards in flexible cords

ANNOUNCEMENT has been made by the Flexible Cord Group of the National Manufacturers' Association of a new standard which will greatly increase the mechanical strength and improve the serviceability of flexible cord.

The new specification, which becames effective Jan. 1, 1930, and after which no cord not fully complying with it will be labeled by the Underwriters' Laboratories, reads as follows:

"All dry braids, both individual and overall, shall be braided of cotton, rayon or silk in such a manner as to result in all adjacent individual parallel threads actually touching each other, and shall show no visible open spaces, when observed through a standard braid counter."

It is also stated that cords complying with the National Electrical Code can be identified by the following points:

1—The parallel threads of all braids must touch when viewed under an ordinary single lens pocket magnifying glass.

2—The rubber covering must be tough and stretchy, similar to that on a good grade of code wire, and of required thickness.

3—The copper conductors must be either tinned or protected by a fibrous cover to prevent corrosion.

4—The minimum copper size for a standard cord is No. 18 American wire gage, usually made up of sixteen strands of No. 30 American wire gage.

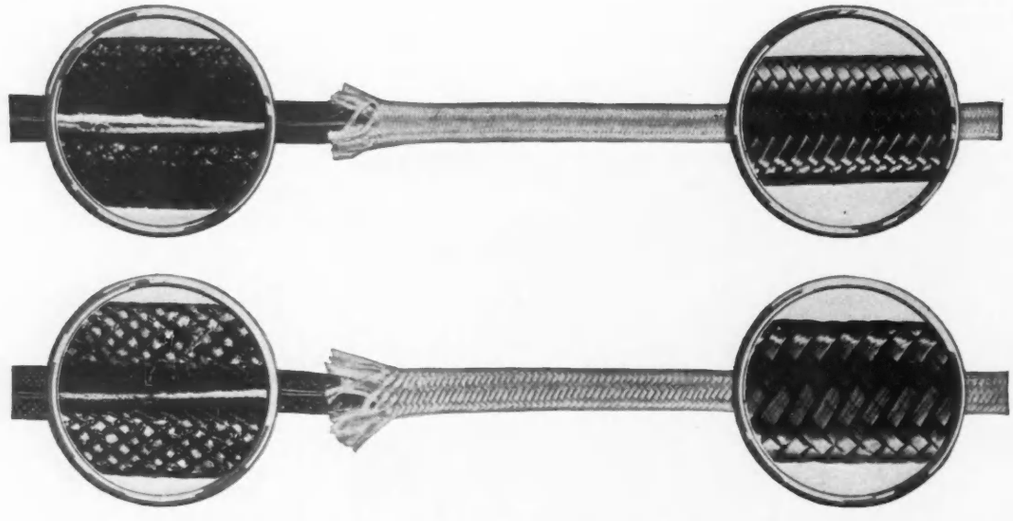
5—All Underwriters' Laboratories standard cords contain manufacturers' identifying markers as required by code and as given in Underwriters' List of Inspected Electrical Appliances.

6—Underwriters' labels further identify Underwriters' Laboratories standard cords.

In discussing the subject of flexible cords recently C. W. Abbott, Technical Committee—Flexible Cord Section—National Electrical Manufacturers' Association said in part, "It is commonly said that with the enormous increase in the use of portable lamps and small portable appliances of one sort and another, flexible cords have gradually come to represent by far the weakest link in our interior wiring system.

"Many experienced inspectors charge against them a considerable percentage of those troubles which lead to overfusing and I am told that they are largely responsible for the increasing number of small electrical fires and for too many sizable fires of electrical origin. Again, it is claimed that they have too large a part in the record of minor electrical accidents and, occasionally, in fatal accidents.

"These cord troubles have been partly due, of course, to the fact that no other electrical material is so widely abused or universally misused, but some of us in the manufacturing field who have been studying this problem carefully for the past few years, are satisfied that the large majority of failures in this class of material are directly traceable to the



When you find cords having open "skeleton" braids similar to those shown in the illustration above, you may be sure they are sub-standard, but, after the new standards become effective and you find cords on which the adjacent threads of all braids touch, like that below, you may be certain that the insulation and conductors are protected and that they are standard cords

nation-wide use of enormous quantities of so-called 'bootleg' or sub-standard cords.

"Many plans and many schemes have been put forward from time to time which it was hoped would remedy this sub-standard cord evil to some degree but, for one reason or another, they have proved impracticable or unworkable. They have fallen short, almost without exception, because the vast bulk of flexible cords, as furnished on portable equipment, is cut into short lengths and assembled with lamps, with appliances or into 'cord sets' by equipment manufacturers who are not electrical men, who know little about codes and who care less, since they are primarily interested in the quantity production of appliances at a price a little under that of their competitors. In other words, there has been no way in which the field inspection departments nor the conscientious buyers of equipment could readily identify a safe, labelled code cord, or could distinguish it from the sub-standard and frequently dangerous non-code cord.

"Once Underwriters' Laboratories' label has been removed, ability to distinguish between code cords and sub-standard or sub-code cords has heretofore involved a considerable knowledge of the technical details of cord structures, considerable time, and especially, a thorough knowledge of braids and of instruments necessary to determine their make-up, for while correct copper size and rubber insulation are highly essential, a flexible cord may almost be said to be as good as its braids—both inner and outer.

"It is obviously foolish to expect the field inspector or the buyer of small equipment to familiarize himself with cotton sizes, details covering number of picks per inch, angle of lay, braider carriers and other elements which enter into braid calculations, so I have said, various efforts to enlist field help in meeting this dangerous sub-standard cord situation have fallen by the wayside.

A New Idea in Braid Standards

"RECENTLY, however, C. P. Berolzheimer, chairman of the Flexible Cord Technical Committee of the National Electrical Manufacturers' Association, hit upon a simple new braid standard for cords, which seems to promise an early improvement because it makes it possible for the field inspector or the buyer of equipment is which cord forms a part, to readily distinguish between labelled cord and the cheap, 'bootleg' cords which have been making so much trouble so far, at least, as braids are concerned. The substance of Mr. Berolzheimer's idea has been unanimously approved by the cord manufacturers and accepted by the staff of Underwriters' Laboratories, so a new paragraph has been recently written into the Flexible Cord Standard which states that cord braids must be so applied that adjacent cotton threads can be seen to actually touch each other when viewed through a relatively low diameter magnifying glass, such as an ordinary single lens pocket glass.

"It is hoped that this new standard is going to end much of the uncertainty about cords—to help many men and the inspectors to distinguish between a dependable labelled code cord and the sub-standard types which are endangering life and property every day.

"It is hoped that this new standard will likewise go far toward stopping the downward, unsafe trend in cord braids which we have seen during the past few years and which are reflected in these fishnet or mosquito bar braids on the sub-standard cords under discussion. If that proves to be the case, we will soon be gettting back to those safe, dependable types of cords which we still find in excellent condition, though they may have been in everyday service on a table lamp for ten or twelve years.

"It is understood, of course, that cords are hard to control; that they are part of the equipment which often comes on the job after the inspector has left it; that they are assembled on cheap lamps or appliances by manufacturers who too often look upon them only as an incidental part of their products; but the cord manufacturers represented in the National Electrical Manufacturers' Association Group have plans which they hope will help to correct this condition through education, under the new cord braid standard, of department store buyers and of the other more responsible retail dealers through whom a large percentage of portable lamps or small portable appliances are now sold.

"The new Flexible Cord Standard, to which I have referred will be published in the very near future but will not go into effect until Jan. 1, 1930, since many manufacturers will have to make provisions to meet it. However, after that date no cord will be labeled by Underwriters' Laboratories which does not comply with the provisions of this new standard, although the usual six months' period will probably be necessary to exhaust field stocks of labelled cords which are now in existence or which will be furnished under old contracts during this fall."

Underwriters' Laboratories Cooperate

FROM the standpoint of Underwriters' Laboratories, C. J. Krieger, of the Laboratories, says in part, "It is increasingly difficult to sit in at any gathering of men interested in electrical matters without eventually getting round to the subject of sub-standard, 'bootleg,' or 'gyp' flexible cords. Offhand this may seem to be a very simple situation, not worthy of serious discussion, and capable of prompt and easy correction; actually it is an extremely complicated matter, and one which is very difficult of solution. It might be well here to review this whole problem, from its inception to its present status.

"What has caused the substandard cord problem? The answer seems almost paradoxical; for the seed of cheap cord seems to have been sowed by one of the greatest of all electrical advances—the convenience outlet. Before this labor-saving device became common, flexible cords were practically all standard; standard because devices using them were relatively few in number, and produced by bona-fide electrical manufacturers who intelligently purchased their cord according to the needs of their appliances, without any thought of deviating from the requirements of the code. The widespread introduction of the convenience outlet led to a demand for more and more domestic electrical appliances, with the result that a vast number of manufacturers entered this field with the sole idea of capitalizing on this demand. These manufacturers were not—and are not—electrical men; they know nothing about the code, and care less; their object is quantity production of devices to curl hair or cook toast at a price lower than the other fellow.

"From the foregoing, it becomes evident that the demand for sub-standard cord arises from economic considerations only. At first glance that appears to be a rather surprising statement; but after many years of contact with this problem, it appears that dollars and cents alone are responsible for present conditions.

"The flexible cord industry, in cooperation with Underwriters' Laboratories, has recently taken two forward steps to assist in the movement to abolish sub-standard cord. The first consists in the adoption of a novel form of braid specification, which is stripped of all technical verbiage, and which will enable the man on the street to tell a standard cord from its 'bootleg' imitation, by simply looking at it. The second, as yet incomplete, involves the marking and labeling of short lengths of flexible cord, so that an official 'OK' stamp will eventually appear on the cord sold with the appliance. It is felt that both of these innovations should help the retailer and his customer.

"The sub-standard cord question is not incapable of solution. It can be done; but it will require the wholehearted cooperation of all concerned before the desired result is attained."

Characteristics of Insulating Materials for Power Cables

The First of a Series Discussing Power Cable Manufacture

This first instalment explains some of the problems entering into cable manufacture and the properties of rubber insulated cables

By E. W. Davis
Simplex Wire & Cable Company

ONE of the most important problems that confronts the electrical engineer today concerns the characteristics and limitations of insulating materials for power cables. Generating apparatus, transformers and receiving apparatus have been developed to a high degree of perfection, so that with known conditions of service, installation can be made with assurance of satisfactory operation. Today we are confronted not with problems of generation or consumption of power, but rather with problems of transmission of power. "Super-power plants" require "super-transmission systems," and in congested districts of our metropolitan areas, these transmission systems are essentially underground.

More Knowledge of Power Cable Insulation Needed

TWENTY years ago, a 6600-volt cable was considered high voltage; fifteen years ago this voltage limit increased to 15,000, ten years ago to 25,000, five years ago, to 60,000, and today—132,000 volts. This phenomenal increase in operating voltages for cable systems, together with equally phenomenal increases in the magnitude of amounts of power to be transmitted demands an increased knowledge of the characteristics and limitations of various insulating materials used in the manufacture of power cables.

A similar problem has confronted the telephone engineer during the last decade. To him, the problem has been one of "Transmission" rather than of "Apparatus," a problem involving line reactances, capacitances and resistances. Improvements in the telephone have been improvements in speech "transmission" rather than improvements in sending or receiving apparatus.

The three materials used for power cable insulation today are: 1—Rubber Compounds; 2—Varnished Cambric; 3—Impregnated Paper. These will be discussed in the order given.

Rubber Insulated Cables—The history of the art of manufacturing rubber insulated wires and cables is a long and interesting one, dating back to the middle of the nineteenth century. From 1880 on, rubber insulated cables were manufactured on a practical basis. Developments and improvements have been many and important. The field for rubber insulated wires and cables is undoubtedly larger and more varied than for any other type of insulated cables. New and larger opportunities are developing every day.

Rubber compounds as used on cables contain up to 60 per cent rubber, together with suitable inert "fillers" and small amounts of active material such as sulphur for vulcanizing, etc. The chemistry of rubber compounds has developed from a "cut and try" method of the past to a highly specialized art which is advancing rapidly. Among the newest developments are the use of accelerators for speeding up the process of vulcanization and securing a more uniform product, anti-oxidants for retarding the deterioration or "aging" of rubber compounds when exposed to air for long periods of time, and the development of reinforcing "fillers" for securing good mechanical properties.

The manufacturer of rubber compounds for insulating purposes is confronted with a rather more serious problem than one whose compounds are used for mechanical purposes only. Ingredients of a rubber compound that may improve its physical or mechanical properties often spoil its electrical properties, and hence must be discarded. Rubber compounds that have the best physical or mechanical properties are absolutely unsuited for electrical insulation. One authority on the proper compounding of rubber

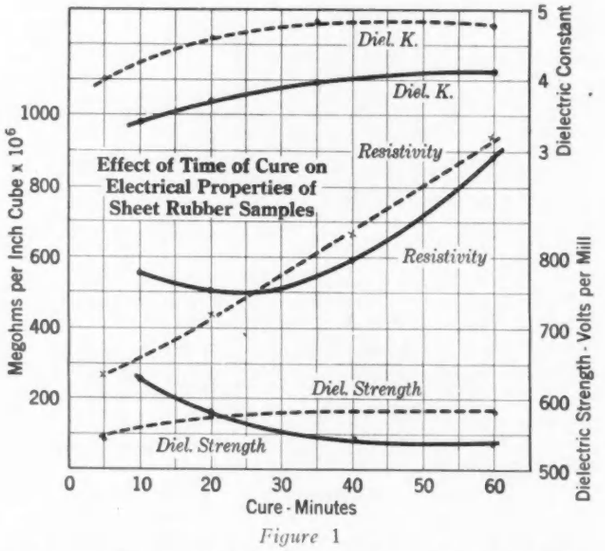


Figure 1

A chart showing graphically the effect of the time of cure upon the different electrical properties of two typical rubber compounds

to be used for mechanical purposes has listed over 400 different ingerdients that may be used. In contrast to this, the manufacturer of rubber compounds for electrical insulation is able to use approximately only 20. Among these are zinc oxide, certain forms of carbon black, litharge or lead oxide, whiting or calcium carbonate, M. R. or Gilsonite, iron oxide, blue lead, chromium oxide, reclaimed rubber or shoddy, paraffine and ozokerite, palm oil and stearic acid, sulphur, and a few organic accelerators.

By a proper combination of these various ingredients, together with raw rubber, compounds can be made with a tremendously wide range of insulating properties, such as insulation resistance, dielectric strength, electrostatic capacity, and at the same time have high physical and mechanical properties that are suitable for the service for which the insulated wire is to be used. For instance, when applied to wire, the properties of good rubber compound can be made to vary between the following limits:

Electrical Properties:

Insulation Resistance Constant—700 to 10,000.

Dielectric Constant—3.5 to 7.5.

Dielectric Strength—500 to 1200 volts per mil thickness.

Physical Properties:

Tensile Strength—500 to 3000 lb. per sq. in.

Stretch of a 2-in. sample at break—5 to 12 in.

Applications of Rubber Insulated Cables

RUBBER insulated cables have high dielectric strength, high insulation resistance and good mechanical properties which make them particularly adapted for medium and low voltage distribution. They can be bent to a small radius, installed and jointed more easily than any other type of cable. Moisture and water affect rubber insulation only slightly. Submarine rubber insulated cables without lead sheath have been used successfully at moderate operating voltages.

A growing field for rubber insulated cables is the portable or hard service cable. In these cables, the outer braids or other protecting surfaces are replaced with rubber compounds that have the wearing qualities of the treads on automobile tires. These rubber compounds withstand oil, water, acid, alkali, and mechanical abuse far better than any other type of cable protection. Such cables are used extensively in iron and steel works, in mines, for trailing cables, in garages and mills, and in many other places where extreme abuse is found.

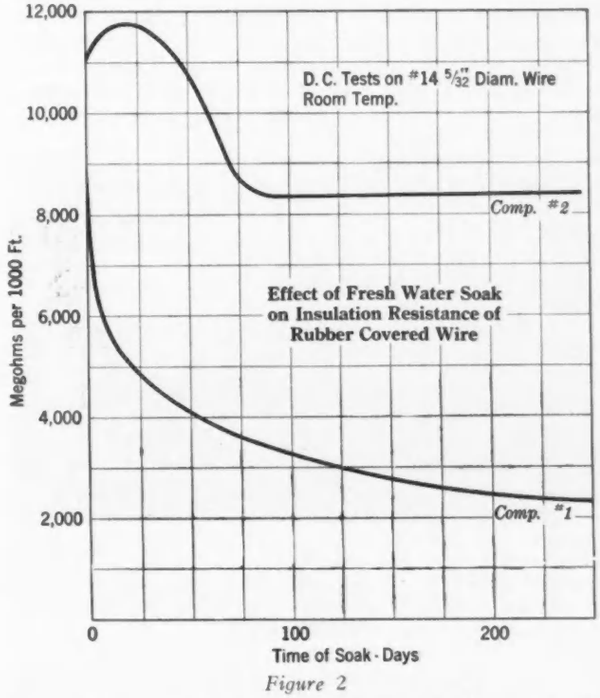


Figure 2

One of the most interesting of the studies of rubber compound is the effect of prolonged soak in water, as shown in the chart

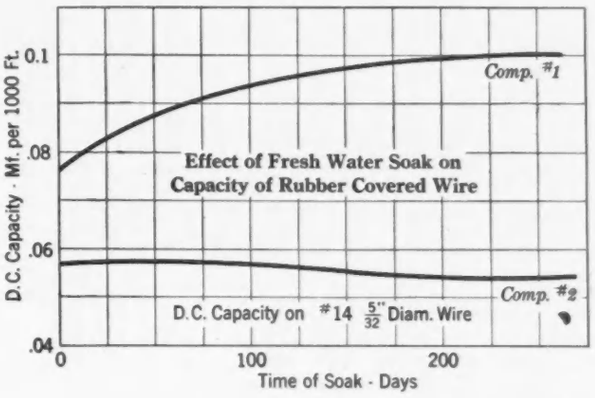


Figure 3

This chart shows the change of direct current capacity with time of soak for two different types of rubber insulating compounds

For high tension work, rubber compounds are not particularly well suited. Wherever there is a voltage stress, there is always a tendency for the formation of ozone. Where this stress is sufficient and where there is air present, ozone is formed in a considerable amount. Rubber compounds of all kinds are particularly susceptible to the destructive effects of ozone. When used in high voltage cables, rubber compounds must be protected against ozone, and such protection is often impossible. Much can be accomplished by the use of rubber compounds that have the proper electrical properties to lessen the formation of ozone.

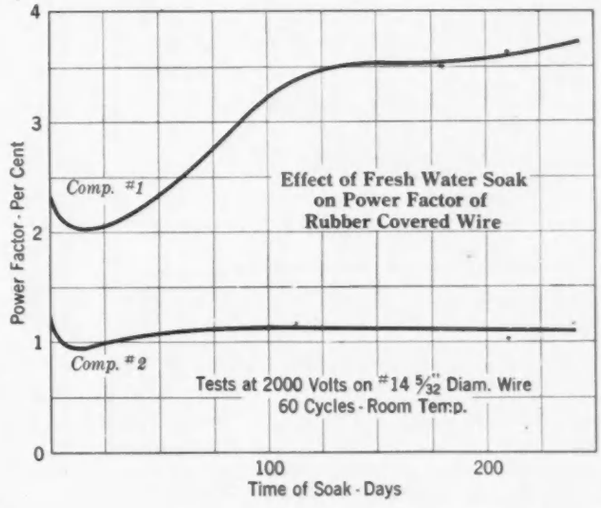


Figure 4

Another chart showing the effect of fresh water soak on the power factor of rubber insulated power cables

All rubber compounds deteriorate or "age" in service, especially when exposed to high temperature, air and sunlight. The "aging" is really a form of oxidization and results in loss of tensile strength, stretch and elasticity or life. Electrical properties are also somewhat reduced. In the study of rubber compounds, it is evident that a suitable

accelerated "life test" should be available to determine in a relatively short time the aging properties of the various compounds. Early life tests were carried out by exposure of the sample to direct sunlight and air. The disadvantage of this test was mainly the long time taken to produce results. At the present time, there are two methods for making life tests in common use, one known as the Geer Life and the other as the Oxygen Bomb Test.

The Geer Life Test is carried out by subjecting the sample to moving air heated to a temperature of 70 deg. C. for a period of four days (96 hrs.). The sample is then allowed to cool and remain at room temperature for 24 hr. before testing. This test represents approximately the change that would occur after one to two years when exposed to sunlight and air of an ordinary room. The

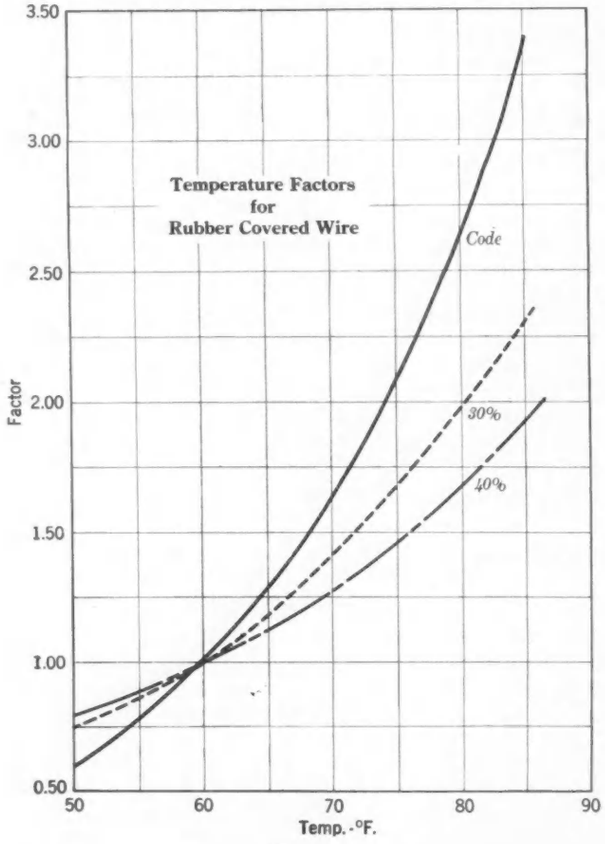


Figure 5

This chart shows the effect of temperature on the resistivity of three typical compounds with various percentages of rubber

maximum change of tensile strength for this test should be 50 per cent and for stretch about 30 per cent.

The Oxygen Bomb Test is much more severe and is carried out by subjecting the sample to oxygen under 300 lb. pressure at a temperature of 70 deg. C. For comparison with the Geer Life Test, 18 hr. in the oxygen bomb is equivalent to two years of natural life, while 96 hr. in the Geer Life Test was necessary for the same aging to take place. The oxygen bomb test is of much more recent development and is in general used only for the higher grade compounds because of its severity. Much more work is yet to be done on these two "aging" tests, but they have been of great value in the development and improvement of rubber compounds.

All rubber compounds depend largely for their electrical and mechanical properties upon the proper "cure" or "vulcanization." Figure 1 shows the effect of the time of cure upon the various electrical properties of two typical rubber compounds. It will be noted that generally speaking, the dielectric constant and resistivity increase with time of cure, while the dielectric strength decreases for one compound and increases for the second. This variation of electrical properties is quite characteristic, but can be controlled by the proper ingredients in the compound.

One of the most interesting of studies of rubber compounds is the effect of prolonged soak in water. Compound No. 1 (Figure 2) is an ordinary commercial insulating compound, while No. 2 was specially designed for low dielectric constant, high resistivity, dielectric strength and long life. It will be noted that No. 2 showed a slight increase of resistivity during the first twenty days' soak, that it remained at a constant value after approximately 100 days' soak. Compound No. 1 showed at first a rapid drop in resistivity and then more gradual but continuous drop during the entire test of 250 days.

Figure 3 shows the change of D.C. capacity with time of soak for the same two rubber compounds used in Figure 2. After 250 days, compound No. 2 shows practically no change, while compound No. 1 has increased approximately 33⅓ per cent.

Figure 4 shows change of power factor with time of soak for the same two compounds under consideration. Here again is seen the very marked superiority of compound No. 2 over No. 1.

The Resistivity of Typical Compounds

FIGURE 5 shows the effect of temperature on the resistivity of three typical compounds with various percentages of rubber. It will be noted that the higher the percentage of rubber, the less the change of resistivity with temperature, the change for a 40 per cent compound being only approximately 50 per cent of that for a code grade of compound.

Ozone causes very rapid deterioration of rubber compounds.

Figure 6 shows the effect of ozone on a rubber insulated cable. Even though the dielectric strength of the compound may be very great, ozone formed by a comparatively low voltage may cause very rapid deterioration in a short time. Certain types of plain rubber insulated ignition wire that have a dielectric breakdown strength of 30 or 35,000 volts may be destroyed in a few minutes on an ignition system where the voltage is never over 12

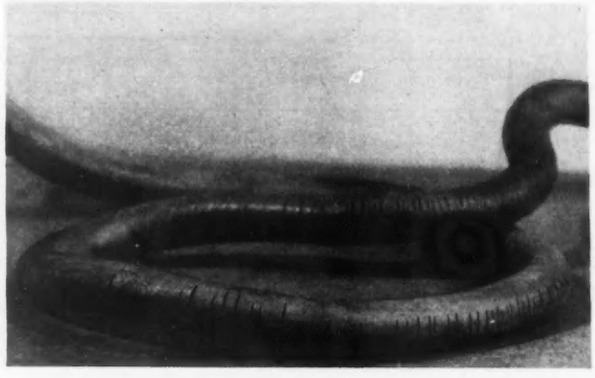


Figure 6

Even though the dielectric strength of the rubber compound may be very great, ozone formed by a comparatively low voltage may cause rapid deterioration in a short time

or 15,000 volts. Ozone cuts have been found in rubber insulated cables on 2300 volt systems.

(*To be continued*)

When Your Big Customer Applies the "Acid Test"

Some interesting tests made to determine first, the feasibility of pushing the sale of an electric water heater and second, which type to campaign

By R. D. Morrison
Industrial Engineer
Central Maine Power Company

WHEN we first began thinking of providing an electric water heater service, our idea was that it must be an off-peak proposition. This was in order to offer our customers a 1½ cent per kw.-hr. rate and to keep the cost of operation for the average family down to approximately six or seven dollars a month.

With this thought in mind we experimented with several different makes of heaters, using a time switch, and we confined the tests to the low wattage, automatic, insulated tank, operating from six-thirty at night to six-thirty in the morning. And there was a second setting on the time switch so that the heater could operate between eleven-thirty and one-thirty at noon. The results of these tests are shown in Table I.

The operation of heater No. 1 was very satisfactory except that the high temperature of the water brought about corrosion of the galvanized tank, causing rusty water to be delivered.

Heater No. 2 was not satisfactory as sufficient hot water was not available during peak draw-off. This was probably due to the fact that the heater was of only 40-gallon capacity.

Heater No. 3 was quite satisfactory, although it was reported that frequently during heavy draw-off, the water cooled off very rapidly.

Every heater which we tested was placed in the same home under the same conditions, in order to secure results that would be on a comparative basis. In this home there were: Three adults and one child; six hot water faucets; one bath tub; one laundry tub; one shower bath.

Upon analyzing the results of these tests the question arose as to whether it was really necessary to operate a water heater only during off-peak periods, requiring an

TABLE I

Comparative Tests of Three Types of Automatic Water Heaters Under Similar Conditions

	Heater No. 1 Foreign Make 2400 W.-220 V.	Heater No. 2 Amer. Make 2000 W.-220 V.	Heater No. 3 Amer. Make 2000 W.-220 V.
Length of test—days	235.0	55.0	49.5
Capacity of tank—gallons	52.8	40.0	52.0
Av. temp. at faucet—°F	195.0	145.0	174.0
Av. temp. inlet water—°F	47.0	47.0	47.0
Temp. rise—°F	148.0	98.0	127.0
Water heated—gallons	7268.0	2087.0	2035.0
Kwh. used	3202.0	699.0	648.0
Kwh. per day	13.6	12.7	13.1
Kwh. per gallon	0.441	0.335	0.319
Gallons per day	30.9	38.0	41.2
Gals. per person per day	7.7	9.5	10.3
Kwh. per month (30 day)	408.0	381.0	393.0
Gals. per month (30 day)	927.0	1140.0	1236.0
Cost per gal. @ $0.015 Kwh	$0.0066	$0.00503	$0.0048
Cost per day @ $0.015 Kwh	$0.204	$0.191	$0.196
Cost per month @ $0.015 Kwh	$6.12	$5.73	$5.90
Cost per person per day @ $0.015 Kwh.	$0.0508	$0.0477	$0.049
Cost per person per month @ $0.015 Kwh	$1.53	$1.43	$1.47

In this set of tests a time switch was used so that the heater operated from six-thirty at night to six-thirty in the morning and again between eleven-thirty and one-thirty at noon.

TABLE II

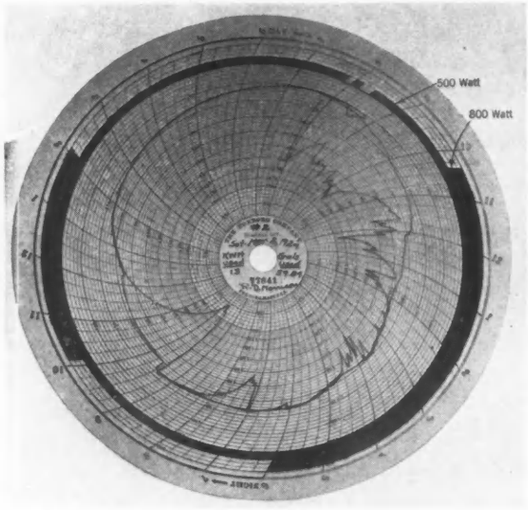
Test Data of a 50 gallon Split Unit Storage Heater. Units—500 and 800 Watts, 110 Volts

Readings for the month of February, 1929

Date	Kwh. used	Cu. ft. H_2O	Gals. H_2O	Kwh. Gal.	*Temp. H_2O	Remarks
Feb. 1	7.2	3.0	22.44	0.321	170/162	
" 2	17.2	7.0	52.36	0.329	170/158	Cleaning House
" 3	14.2	7.0	52.36	0.272	170/162	Baths
" 4	15.2	7.0	52.36	0.291	180/166	Family Wash
" 5	11.2	4.0	29.92	0.375	180/164	
" 6	8.2	3.0	22.44	0.366	180/164	
" 7	10.2	3.0	22.44	0.455	180/164	
" 8	12.0	5.0	37.40	0.321	180/164	
" 9	13.0	5.0	37.40	0.348	180/166	Cleaning House
" 10	15.0	8.0	59.84	0.251	170/160	Baths
" 11	16.0	6.0	44.88	0.357	180/162	Family Wash
" 12	10.0	4.0	29.92	0.355	180/166	
" 13	12.0	4.0	29.92	0.402	180/164	
" 14	20.0	10.0	74.80	0.267	180/164	Cleaning House
" 15	10.0	3.0	22.44	0.447	180/166	
" 16	16.0	9.0	67.32	0.238	180/166	Cleaning House
" 17	10.0	10.0	74.80	0.134	180/166	Baths
" 18	20.0	3.0	22.44	0.890	180/164	Family Wash
" 19	9.0	3.0	22.44	0.401	180/164	
" 20	15.0	5.0	37.40	0.402	180/164	
" 21	5.0	2.0	14.96	0.334	180/164	
" 22	10.0	4.0	29.92	0.335	180/164	
" 23	17.0	7.0	52.36	0.325	180/164	Cleaning House
" 24	9.0	3.0	22.44	0.401	180/164	
" 25	14.0	6.0	44.88	0.312	180/166	Family Wash
" 26	12.0	4.0	29.92	0.402	180/164	
" 27	13.0	4.0	29.92	0.435	180/166	
" 28	13.0	6.0	44.88	0.289	180/166	
Total	354.4	145.0	1084.60	0.327		

*Indicates temperature at tank thermometer and temperature at faucet.

Here the heating unit was split 500 and 800 watts and there was no time switch. Instead, the units were allowed to come on and off automatically during the 24 hours.



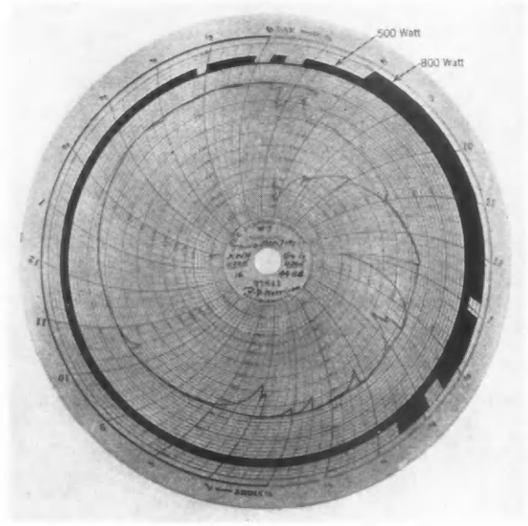


TABLE III

Test Data of a 50 Gallon Storage Water Heater, Split Unit, 1300 Watts. Units—500 and 800 Watt —110 Volt, at Different Temperatures

	Thermostat set for 190° F.	Thermostat set for 170° F.	Thermostat set for 150° F.
Length of test in days	24	28	7
Av. temp. at faucet—°F.	175	165	138
Av. temp. inlet water—°F.	45	45	45
Temp. rise	130	120	93
Water heated in gallons	965	1085	321.56
Kwh. used	327	354.4	79
Kwh. per day	13.62	12.63	11.29
Kwh. per gallon	0.339	0.327	0.246
Gals. per day	40.3	38.8	45.8
Gals. per person per day	10.07	9.7	11.45
Kwh. per month (30 day)	408.6	378.9	358.7
Gals. per month (30 day)	1209.0	1164.0	1374.0
Cost per gal. @ $0.015 Kwh	$0.00509	$0.0049	$0.00369
Cost per day @ $0.015 Kwh	$0.204	$0.1894	$0.1684
Cost per month @ $0.015 Kwh	$6.12	$5.68	$5.08
Cost per person per day @ $0.015 Kwh	$0.051	$0.0473	$0.0421
Cost per person per month @ $0.015 Kwh	$1.53	$1.42	$1.27

The data with different settings of the thermostat.

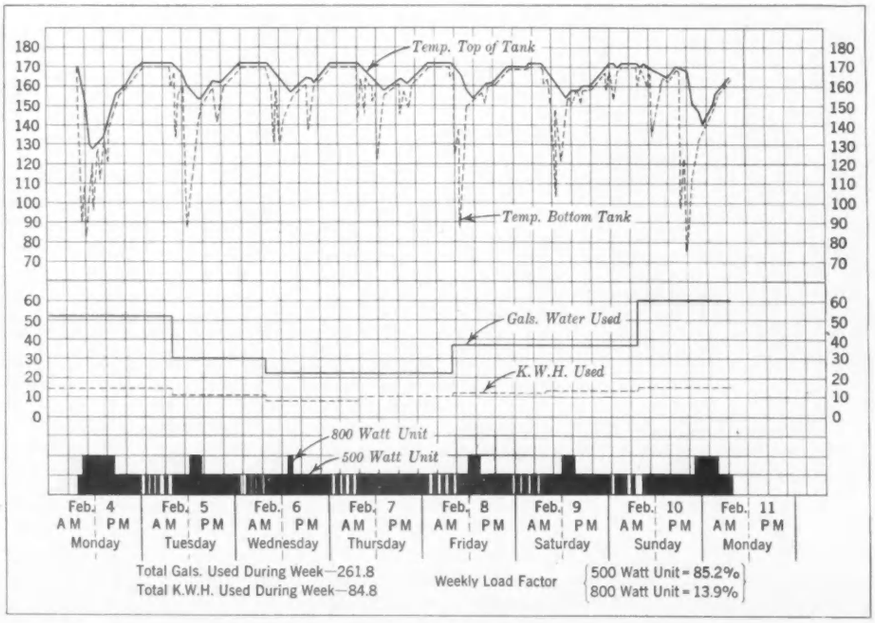
expensive time switch and load-limiting devices; when by the use of a smaller heating unit the load could be distributed over the entire 24-hour period.

If this could be done the cost of the installation would be reduced by having the heating unit of such size that it would come within the ruling of the National Electrical Code for two-wire, 110-volt service.

It also seemed advisable to have this unit of the split type so that part of the unit would be on practically all of the time, and the remainder of the unit would take care of the peak draw-off.

So we had a heater of this type built to our specifications by an American manufacturer. This heater was of 50 gal. capacity, and the heating unit was split 500 and 800 watts. The time switch was eliminated and the units allowed to come on and off automatically during the 24 hours.

We also installed a recording ammeter, recording watt meter, and a two-pen recording thermometer to get the


Temp. Top of Tank
Temp. Bottom Tank
Gals. Water Used
K.W.H. Used
800 Watt Unit
500 Watt Unit
180 170 160 150 140 130 120 110 100 90 80 70
60 50 40 30 20 10 0
Feb. 4 AM PM Monday
Feb. 5 AM PM Tuesday
Feb. 6 AM PM Wednesday
Feb. 7 AM PM Thursday
Feb. 8 AM PM Friday
Feb. 9 AM PM Saturday
Feb. 10 AM PM Sunday
Feb. 11 AM PM Monday
Total Gals. Used During Week—261.8
Total K.W.H. Used During Week—84.8
Weekly Load Factor
500 Watt Unit = 85.2%
800 Watt Unit = 13.9%

IN the upper left are typical temperature charts with the split 500 and 800-watt units. Wattage, temperature and gallons of water used during a typical week are shown simultaneously on the set of curves at the left. The solid temperature curve indicates temperature at top of the tank and the dotted, at the bottom

temperature of the water in the tank both at the top and bottom.

We were greatly surprised to find that the load factor of the 500-watt unit was around 80 per cent and that of the 800-watt unit approximately 13 or 14 per cent. We later changed this 800-watt unit to one of 1000 watts.

Some of the figures obtained are indicated on the curve sheets reproduced with this article.

With the load factor as indicated by the operation of this heater, we could not see any justification for the larger units to be operated only on off-peak and requiring the customer to purchase an expensive time switch, which would require more or less attention.

Except where the Demands Are Unusually Large the Thermostat is set at 150 Degrees

We are operating these heaters with the thermostat set at approximately 150 deg., and if trouble arises due to the lack of hot water during the peak draw-off, the setting is increased to 165 to 170 deg.

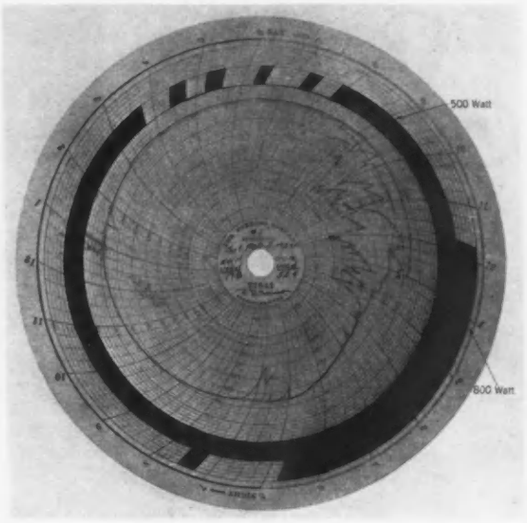
There have been a few special cases encountered where there are three or four bathrooms in the house with eight or ten in the family, with a daily consumption of 100 gal. and upwards.

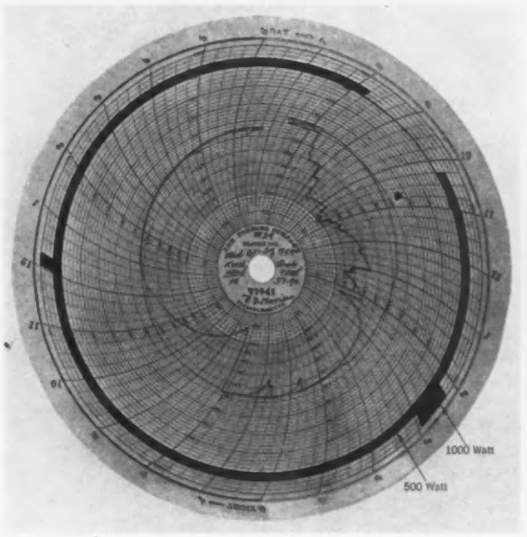
On installations of this class we install two of these heaters connected in series: the first heater has its thermostat set at 145 to 150 deg. and the second one at 160 deg. Here the first tank serves as a tempering tank. So far, customers coming in this class have never complained of the hot water service.

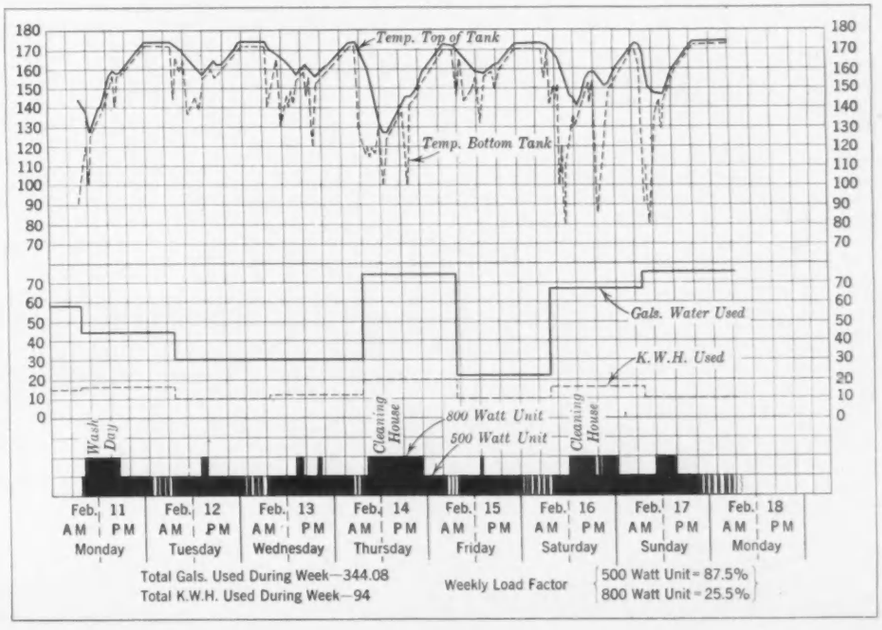
We have standardized on the 1500-watt unit, split 500-1000, for this year's program, and find that the 500-watt unit comes on when the water drops to approximately 140 deg., and the 1000-watt unit when the temperature drops to 120 deg. Thus it is seen that the 1000-watt unit is working very little of the time.

Of the 180 heaters sold in 4½ months this year, ten have had the unit changed from 1500 to 3000-watts. These have been cases where it was necessary to install two heaters.

It was strictly on the basis of the load factor obtained from these tests made on our own property that our rate of 1½ cents per kw.-hr. was arrived at, which, it would appear is a fair price that is well within the means of those using automatic electric water heaters.

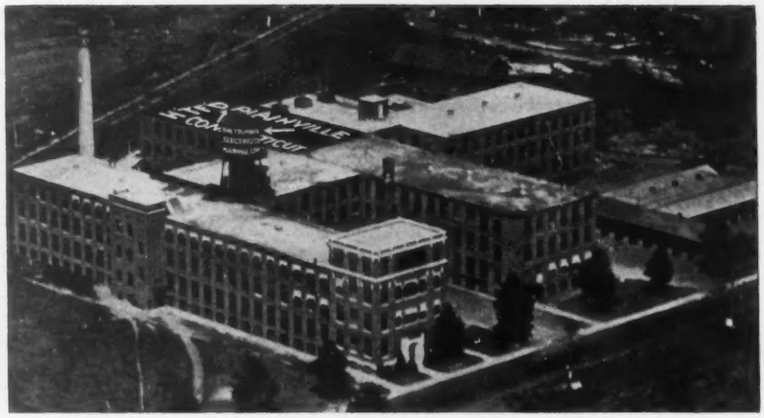





Temp. Top of Tank
Temp. Bottom Tank
Gals. Water Used
K.W.H. Used
800 Watt Unit
500 Watt Unit
Wash Day
Cleaning House
Cleaning House
Feb. 11 AM PM Monday
Feb. 12 AM PM Tuesday
Feb. 13 AM PM Wednesday
Feb. 14 AM PM Thursday
Feb. 15 AM PM Friday
Feb. 16 AM PM Saturday
Feb. 17 AM PM Sunday
Feb. 18 AM PM Monday
Total Gals. Used During Week—344.08
Total K.W.H. Used During Week—94
Weekly Load Factor
500 Watt Unit = 87.5%
800 Watt Unit = 25.5%

THE ABOVE recording meter charts and those on the opposite page show the tracings of two pens on the thermometer—one for the top and the other for the bottom of the tank. In the curve sheet at the right the effect of wash and cleaning days on wattage, water consumption and temperatures is interesting.

Safety Switch Production



Factory of the Trumbull Electric Manufacturing Company at Plainville, Conn.

SAFETY switches, panelboards and small switchboards have an important place in the electrical industry and in their manufacture many interesting operations are involved. One of the largest organizations engaged in the production of such apparatus is the Trumbull Electric Manufacturing Company of Plainville, Conn. This and the following four pages discuss the activities of this company briefly and illustrate some of the work carried on in its plant.

LIKE many of our larger and more prosperous industries today the Trumbull Electric Manufacturing Company had a most humble beginning. On Oct. 15, 1899, John and Henry Trumbull moved into a small vacant factory building in Plainville, Conn., where they set about to manufacture small rosettes for electrical purposes. About a month later Frank T. Wheeler joined in the work and when, in a short time the original company was capitalized for $2,000, Frank T. Wheeler was elected president, Henry Trumbull, secretary, and J. H. Trumbull, treasurer. After nearly thirty years of operation the executive officers of the present organization are: J. H. Trumbull, president; Frank T. Wheeler, vice-president; Henry Trumbull, treasurer, and S. S. Gwillin, secretary.

The equipment they had was for the most part second-hand, patched-up, readapted and made to run, while power for its operation was supplied by an antiquated, one-lung engine that had the bad habit of breaking down at critical times. Soon a sign "Trumbull Electric Co." appeared over the door of the shop and operations began. Besides the three proprietors, the help consisted of two or three young adventurers, not afraid of long hours or hard labor.

Quarter-turn rosettes, designed and patented by J. H. and Henry Trumbull, were the first products to be made. And, for three young chaps with little or no manufacturing, selling, financial or merchandising experience, with almost no money and absolutely no encouragement, to set up such an organization was a feat of some daring.

However, despite these early obstacles, thirty years has brought about many changes in the first Trumbull Electric Co. Today it is a subsidiary of the General Electric Company and is recognized as one of the largest switch gear manufacturers in the country. It appears to have grown by leaps and bounds and with ever increasing demands for its products its original plant has been expanded to keep pace with requirements.

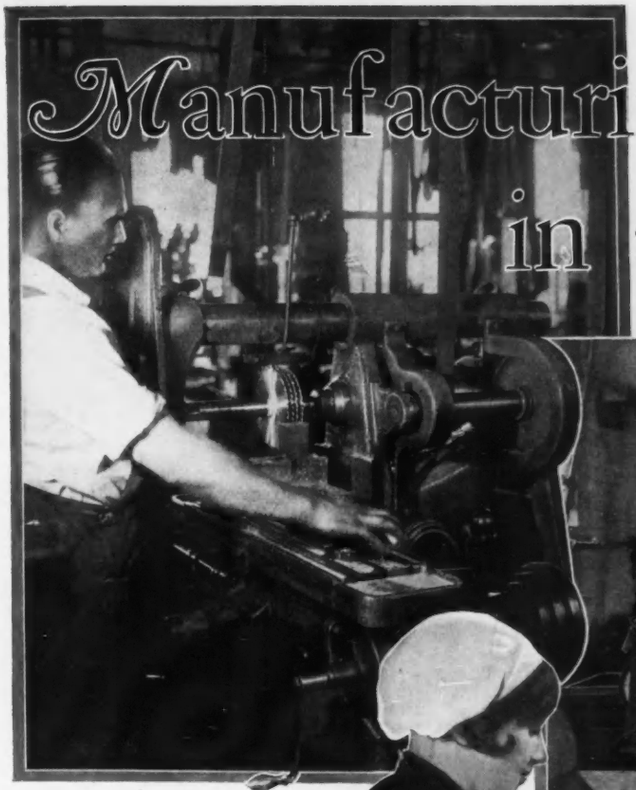
Today, the original organization is known as the Trumbull Electric Manufacturing Company and its products include twenty-nine different lines, divided into four major classes — such main classes being Open Knife Switch schedules, Safety Switch schedules, Panel and Switchboard schedules, and all miscellaneous schedules such as Battery Switches, Cutouts, Wire Connectors and the like.

All of these various products are manufactured in a large modern factory by hundreds of workmen, with the latest that is to be had in the way of production and manufacturing equipment. Essentially the factory buildings are in the form of a large double letter H. All of the larger units are four stories in height and all departments are served by materials handling apparatus, where such equipment will afford any advantage. There are no logical divisions such as that of segregating one class of work in one building, but rather the entire plant is so arranged that the work flows through in well-planned sequence, elevators serve all floors of the plant; elevating platform trucks transport materials and products within the plant; motor trucks make outside deliveries and railroad sidings connect the factory directly for receiving and shipping purposes.

Insofar as possible all heavy machine operations are confined to the lower floors of the different buildings, while the lighter work and most of the assembling of the various apparatus is done on the upper floors. Since much of the work is turned out in quantities many jigs, fixtures and special tools are employed in the various departments.

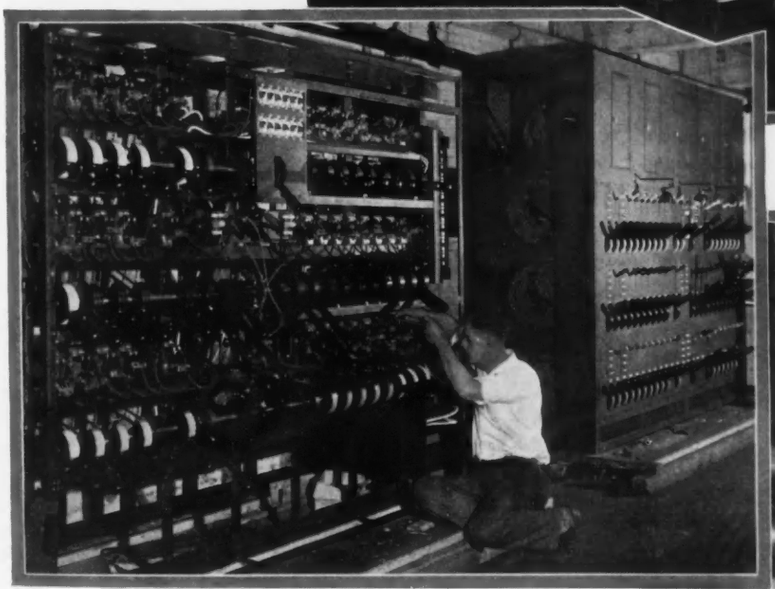
Because of a certain amount of congestion in some departments and to permit of rearranging others another unit is at present being added to the plant. This will be in the nature of a two and three story brick and concrete building, adjacent to the present factory, and will provide approximately 40,000 sq. ft. of additional floor space. Present plans call for a new and most complete polishing and plating department in the new structure; the expansion and rearrangement of others, all looking to the more efficient and speedier manufacture of switch gear.

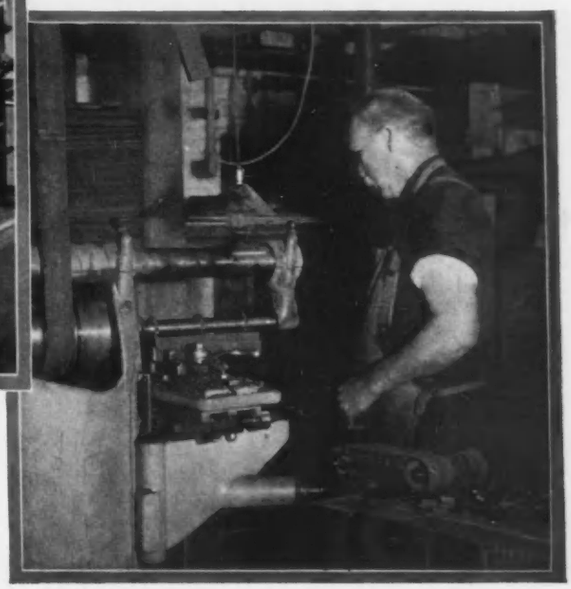
Manufacturing Operations in a Safety Switch Plant



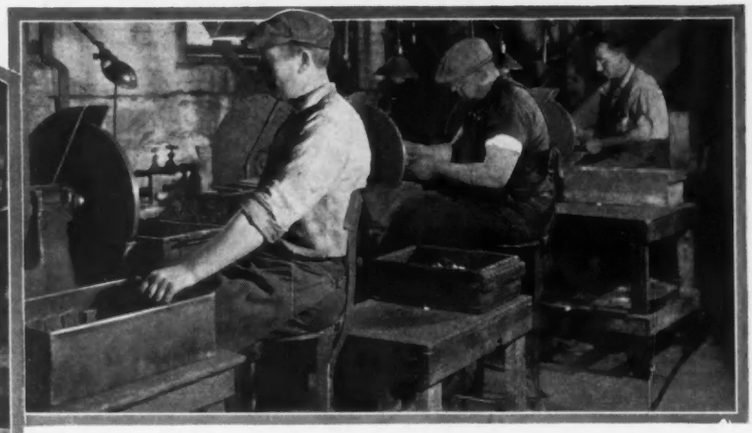
ONE of the many milling machine operations incident to the manufacture of Trumbull safety switches and panelboards is shown in the view above. The operator at the right is tapping some small parts

ON this and the three following pages are illustrations and explanations of some of the more important manufacturing operations in the plant of the Trumbull Electric Manufacturing Company, at Plainville, Conn. Practically all of the work in this factory is devoted to the production of safety switches, and panelboards

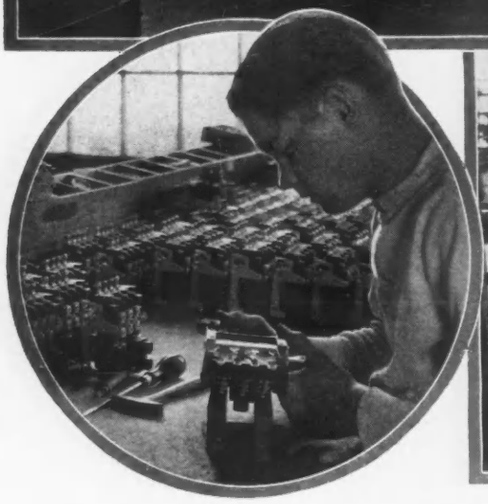


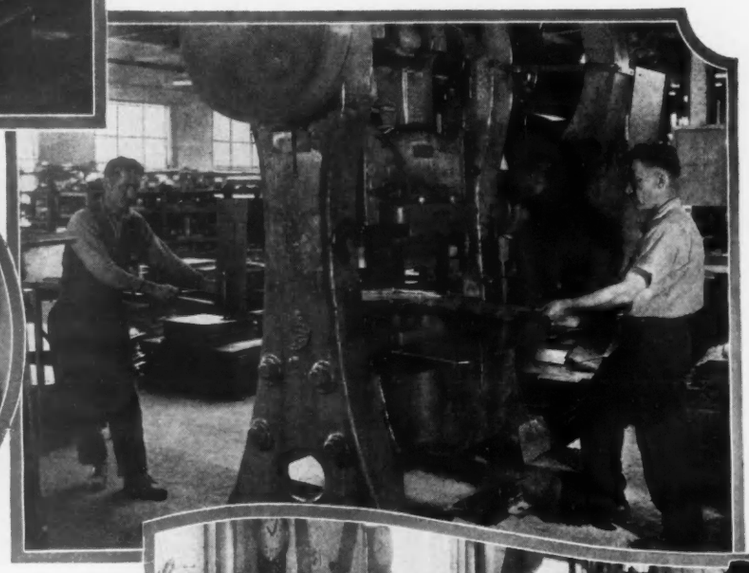


THE workman shown in the illustration above is assembling one of the Trumbull Electric Manufacturing Company's Controlites. As can be seen these are very complicated devices, requiring many production, inspection and assembly operations. The workman at the right is sawing small fibre blocks in a milling machine



AT THE left is one of the large presses used for forming switch box doors. The blanks from which the doors are made are piled on the lift truck skid at the base of the machine. Directly above is that department in which switch and panelboard parts are rough-ground before passing on to the plating room in the next department





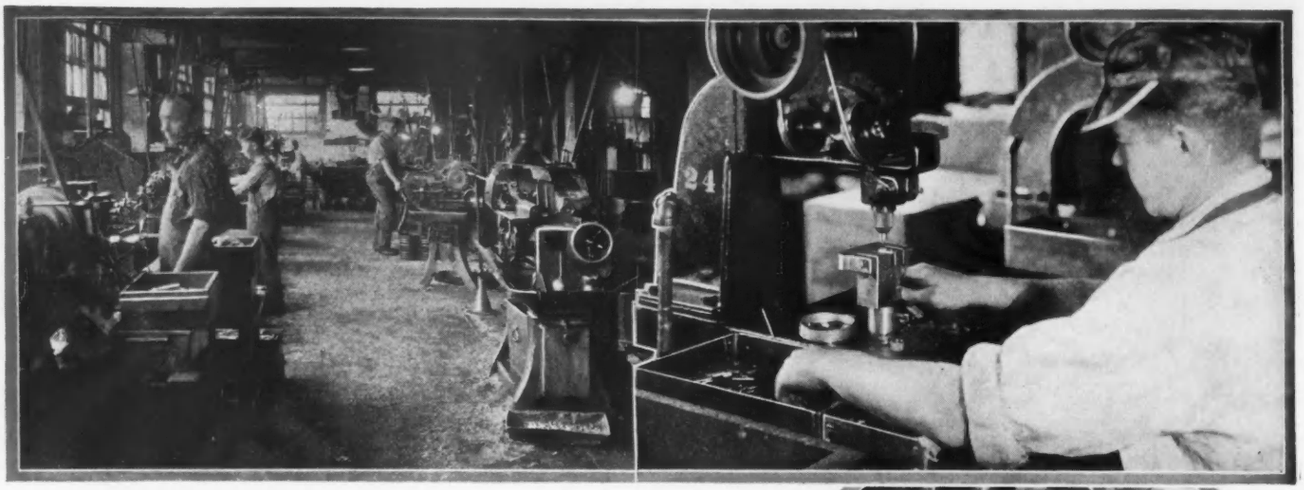
THE illustration above shows one of the assembly operations on Trumbull magnetic switches, while the two men at the right and above are blanking out switch box parts on one of the large power presses in the Trumbull plant. One entire section of the factory is devoted to stamping and forming presses such as this

THE operators at the left are drilling some of the smaller switch and panelboard parts on single spindle drills while the view above shows some of the revolving tubs in the plating department. For smaller work there are revolving plating barrels. In this section of the plant all copper and chromium plating is done. This work will be moved into the new plant

IN THE Trumbull plant every precaution is taken for the safety of employees. Above is a view of one section of the first aid department in the factory. It is fully equipped and a trained nurse is in attendance at all times. At the right is one of several high-speed drills that is employed for drilling small holes in copper blocks that are used in panelboard and switchboard construction

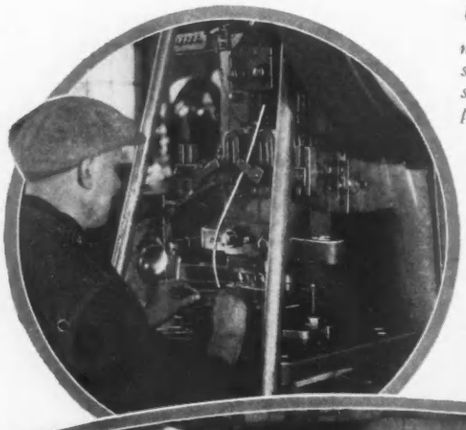
PRACTICALLY all of the small tools, jigs, dies and fixtures used in the Trumbull plant are made in the tool room, shown at the left and above. In the circle above is a workman engaged at sawing sheets of fiber into blocks and strips for use as insulating members

DIRECTLY above and at the right are two views of the panelboard and small switchboard assembly departments. Special racks are provided for the larger boards, while most of the switchboards are put together at several benches along the wall or on special portable tables located near the benches



MOST of the small screw machine parts used in the construction of safety switches, panelboards and small switchboards are made in the department shown above. It is located in the basement of one wing of the factory. Other examples of safety precautions are shown in the circle below and at the right. These show two types of guards employed on punch presses. Both of them are so designed as to prevent the operator from getting his hand under the press during the power stroke of the machine. The workman in the illustration at the extreme upper right of this page is operating a high-speed rivet spinning machine during an assembly operation

UNDER pleasant working conditions and with ample natural light groups of girls assemble the smaller types of switches made in the Trumbull plant. The operator shown below is assembling switches



SINCE many of the pieces entering into safety switch and panelboard construction are small and light in weight tote-boxes are used extensively in the Trumbull plant for the handling of materials and parts

THE operator shown in the illustration below is assembling safety switches. The various parts are manufactured in different departments of the plant, and after passing through the stockroom are transferred to this assembly section in lots, according to the number of switches required. All of the parts receive careful inspection before they are put together in the finished switch, after which the switch is tested

IN the view above, operators are preparing slabs of slate for panelboard and switchboard construction. These are sawed to size and drilled with the proper arrangement of holes in the basement of one wing of the plant and then move to the assembly floor

An Outstanding Example of Motor Repair Shop Organization

By William W. Baxter

Associate Editor, Electrical Manufacturing

With about everything that is to be desired in the way of equipment and organization the J. & H. Electric Company, at 200 Richmond St., Providence, R. I., is an exceptional example of the efficient manner in which a motor repair business can be conducted. This, the first of three articles about this plant, gives a brief outline of the history of the J. & H. Electric Company and in the other two the methods of operation will be explained more in detail.

In every industrial enterprise today, no matter how large or how small it may be, there are certain well-defined business principles that must be understood and fittingly applied to the conduct of that enterprise, if it is to achieve a full measure of success. A manufacturer's facilities may be ever so extensive and he may have formulated his plans of operation ever so carefully, but these amount to little if they are not properly utilized. The possession of a full complement of all of the most modern machines or devices alone will not suffice. He may have the most modern factory, able and skilled mechanics and supervision and then not succeed. His accounting system may be the best, but even with these he must have a well-rounded out organization capable of making the best use of his facilities under any conditions, be they good or adverse.

So it is with the motor repair shop today as it is with the manufacturer. The motor repair shop is a business enterprise. In fact, so extensive has the motor repair business grown within recent years that it is now generally well-recognized as one of the major branches of the electrical industry. Motor repair shops are not set up as "fly-by-night" outfits. They are firmly established and in every part of the country there is urgent demand for them.

Yet, if they are to succeed as an industry, or as individuals, each must plan for his own business, at all times bearing in mind the essentials of good business practice. Of course, things that would apply to one shop may not fit into another, but in general practically all of them can adopt essentially the same fundamental principles of operation.

Generally speaking the motor-repair business has four logical divisions. One is the shop in which only small motors and electrical apparatus are reconditioned. Another is the shop catering only to heavy industrial work. A third is that dealing in second-hand apparatus, where repairs are only incident to resale, while the fourth is the shop repairing any kind of electrical equipment and at the same time conducting a general electrical contracting business.

No matter what the character of the shop may be it must have essentially four things. First, adequate modern facilities and accessories; second, ample plant or factory in which to make full and efficient use of this equipment; third, a most complete cost accounting system, and fourth, and probably most important, a carefully planned shop organization to include all the various phases of the business from sales to the actual repair work. Of course, there are other requirements, such as good lighting, clean and orderly surroundings, and good will, as well as amicable employer and employee relations.

One motor repair shop that has come to the attention of Electrical Manufacturing and in which these things are to be found is that of the J. & H. Electric Company, located at 200 Richmond Street, in Providence, R. I. In its plant it has all of those things necessary to the good conduct of a successful motor repair business. And like

This is the building entirely occupied by the motor repair shop and general contracting business of the J. & H. Electric Company, located at 200 Richmond St., Providence, R. I. The basement is used for manufacturing magnetic chucks; the first floor for repair work and the two remaining floors for the storage of motors, control apparatus and electrical materials

many organizations of its kind the J. & H. Electric Company started in business in a small way. As ever changing conditions demanded it has expanded, adding to its facilities and organization, until today it ranks among the best.

The J. & H. Electric Company began as a small motor repair shop some twenty-five years ago, or to be exact in 1905, under its present name. C. E. Harmon and J. F. Jenks were the founders of the original business, at 95 Chestnut Street, and from the first initials of the last names of these two men the name of the company was formed. In a few years, as business increased, the shop was moved into larger quarters at 155 Clifford Street. About five months ago still larger quarters, more equipment, and a larger organization were needed and so the present shop was acquired.

It is a brick and concrete structure of three stories and basement having upward of 20,000 square feet of factory floor space and in addition there are ample provisions for sales and general offices. While the building was not erected for manufacturing purposes it is admirably suited for that use. The basement, with its floor but a few feet lower than street level, is as light and suitable for manufacturing purposes as any of the three other floors of the building. The ceiling is amply high to permit of the use of line shafting for machine tool drives and a heavy duty freight elevator connects the basement with the other floors. In addition there is a smaller elevator or dumbwaiter for handling lighter materials. Reference to the illustrations showing the floor plans of the shop will show the various uses made of the three floors above street level. As may be seen, the first floor contains the sales offices, shop foreman's office, the shipping and receiving departments and such facilities as are required in the reconditioning of any type of electrical apparatus or equipment. It might be added that both the shipping and receiving departments have large double doors opening onto an alleyway, at motor car body level, and that each door is served with overhead monorail conveyors, connecting directly with the shop and the freight elevator, for the handling of heavy apparatus and electrical materials.

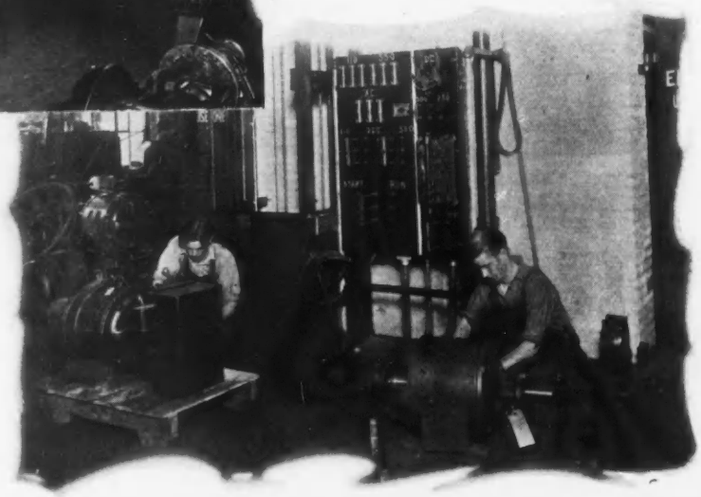
All of the second floor is occupied with racks, bins and shelves, most efficiently arranged for the storage of all of the various kinds of materials needed. Since the J. & H. Electric Company deals in new electrical equipment, such as motors of all sizes and capacities as well as considerable control apparatus, the third floor of the shop is used both for storage and as a display room.

It should be added at this time that the J. & H. Electric Company also manufactures D. & W. magnetic chucks. These are electrical devices used extensively in manufacturing industries, largely for surfacing operations on grinding machines. This business was acquired eight years ago and the production of these chucks forms the major part of the work carried on in the basement of the present factory.

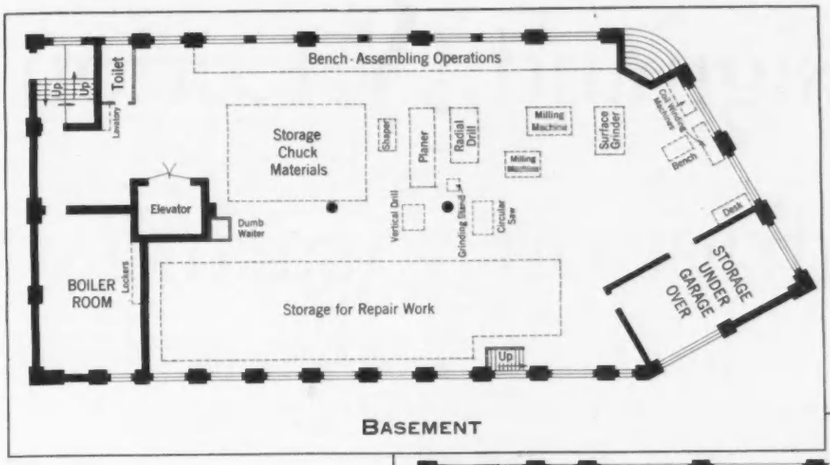
In addition to manufacturing D. & W. magnetic chucks the J. & H. Electric Company carries on an extensive general electrical contracting business. While contracting has been done by this company from the start, it was only taken up on a large scale about two years ago, because of the great amount of wiring that had to be done in connection with the removal or installation of motors and other apparatus. Now, industrial contracting is one of the important departments of the J. & H. Company. It is carried on in connection with the repair shop and much of the material for this work is carried in stock on the second floor of the plant.

As operating at present the J. & H. Electric Company employs about 52 men in the field, in contracting and installation work, and there are 40 additional employees in the shop. One man handles all motor and electrical equipment sales while three field engineers take care of all contract work and one engineer looks after the chuck business. W. M. Hodges is in charge of all shop work, both in manufacturing and repairing. Mr. Hodges, it might be mentioned, is a man with years of experience in the electrical business and about eighteen years ago acquired the interests of J. F. Jenks. At present the organization of the J. & H. Electric Company consists of: C. E. Harmon, president and treasurer; W. M. Hodges, vice-president, and A. S. Pike, secretary.

Inasmuch as ELECTRICAL MANUFACTURING thinks the shop and organization of the J. & H. Electric Company such an outstanding example of an ably conducted motor repair shop, provisions have been made for giving a more detailed account of its activities.

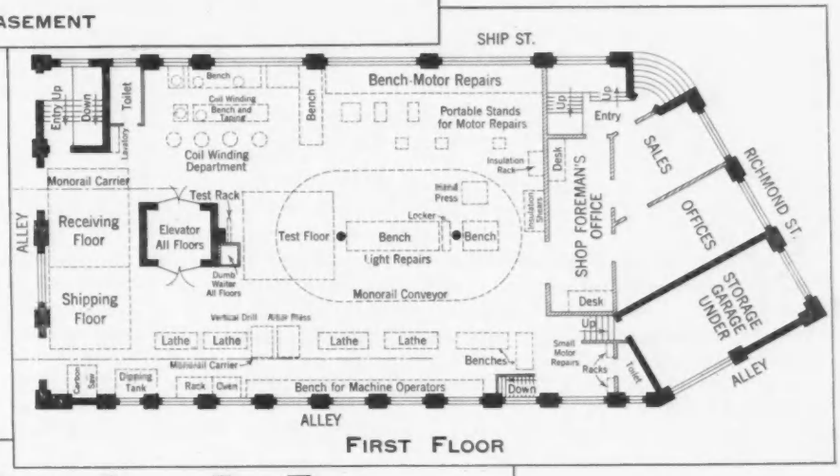


HERE are two views in the motor repair shop of the J. & H. Electric Company, at 200 Richmond St., Providence, R. I. That above shows the small motor repair section of the shop. Notice the orderly arrangement and the well-lighted conditions under which the men work. At the right is but a section of the test floor, with the test rack in the background. It is here that all work either entering or leaving the shop receives the most thorough performance test before it is finally passed for use or repairs, as the case may be

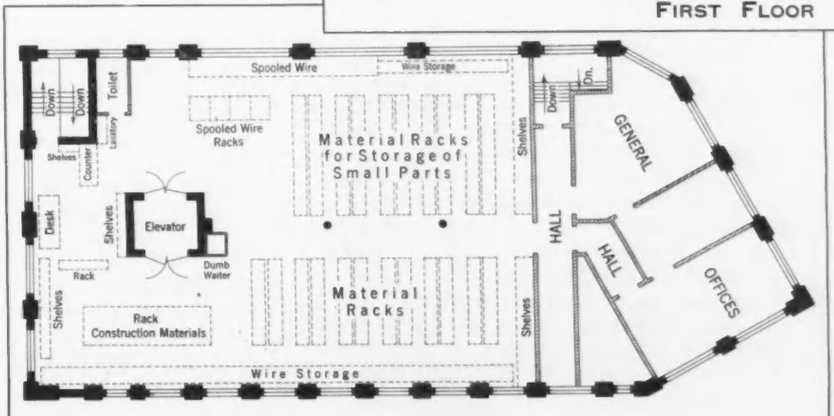


BASEMENT

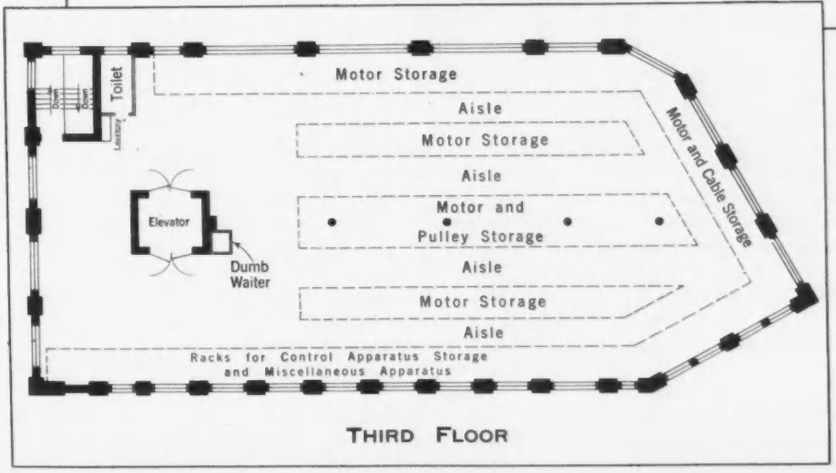
ON THIS page is a composite arrangement of the four floor plans of the motor repair shop of the J. & H. Electric Company. The basement is used solely for the production of D. & W. magnetic chucks; the first floor for reconditioning electrical apparatus, and the second and third floors for the storage of materials such as are used in repair work, electrical contracting and for sale. It will be noticed that ample equipment has been provided on all floors



FIRST FLOOR



SECOND FLOOR



THIRD FLOOR

It should be understood in connection with the manufacturing and contracting work carried on by the J. & H. Electric Company that it is all handled separately from the motor business, and these phases of the work will not be discussed more than is necessary to describe other operations and methods. For this reason such record forms as are discussed will relate only to motor repair work and the accounting for such labor and materials as are used in the motor repair shop.

One thing of particular significance that will be noted throughout this motor repair shop is cleanliness and order. There is a place for everything and everything is kept in that place. In this manner there is little chance of confusion and a minimum of effort in the conduct of the work. No materials are stored in the working departments of the shop, wide aisles permit of free passage from one section to another, and from the attitude of the many workmen it is clearly evident that they take an interest both in the shop and their work.

In the November issue of ELECTRICAL MANUFACTURING there will be published an explanation of the methods employed in the motor repair shop of the J. & H. Company, together with a description of the equipment available and the uses to which it is adapted. This second article will be followed by another instalment in the December issue, in which the accounting methods employed in the motor repair business will be described in detail, including reproductions of the more important records and forms of different

The Design and Selection of Antifriction Bearings

The first of a series of articles treating of the characteristics of bearings and their design and selection for use in electrical apparatus

By GUSTAV A. UNGAR
Consulting Engineer

MODERN bearing practice owes its present high degree of development almost entirely to the automotive industry with its exacting requirements for performance and the necessity of the greatest manufacturing accuracy at low cost.

Antifriction bearings in particular could never have been developed to the present extent of use in almost every type of machinery if it had not been for the automotive field. There the rapidly mounting quantity requirements enabled the manufacturers of antifriction bearings to gain the necessary technical experience which enabled them to enter other fields in which the then existing plain bearings had not always kept abreast with the demands for increased operating speeds and operating economy.

Electrical machinery in particular presented a fruitful field and the manufacutrers of antifriction bearings did not fail to grasp their opportunity to utilize the engineering knowledge gained in the automotive field. Because of the lack of similar aggressive policies on the part of the proponents of plain bearings, antifriction bearings, especially ball bearings, were considered the panacea for all bearing troubles. As a result of this, many antifriction bearing installations were made in electrical machinery when difficulties had developed with plain bearings. In many instances no proper knowledge of load or service conditions was available and while satisfactory results in many cases fulfilled the expectations, there still were a sufficient number of failures so as to noticeably dampen the ardor of antifriction bearing enthusiasts.

The rapidly increasing spread of antifriction bearings in spite of the difficulties which were encountered in applying them to the electrical and other fields, finally brought about a decided and successful effort to improve plain bearings and their lubrication. As a result of this, the subject of plain and antifriction bearings in electrical machinery has become highly controversial. The issue of actual merits and disadvantages, being the only one of real importance to the designing engineer and the user, has become somewhat obscured through arguments pro and con by partisans of both types of bearings.

The situation is rendered more complicated because a clean cut decision as to relative merits is not always easy, due to the fact that a variety of factors enter into the selection of the most suitable bearing. In order to assist the designer and manufacturer of electrical machinery in judging bearing problems, there will be presented here an outline of facts and data available at the present time regarding the various types of bearings, together with an appropriate summary. This information will be of value in the design and selection of bearings.

GUSTAV A. UNGAR was born in Vienna, Austria, in 1883, and is a graduate in Mechanical Engineering of the Vienna Polytechnic University. From 1903 to 1908 he was occupied as draftsman and designer for leading German and Austrian automobile manufacturers. The following three years he served as Chief Engineer of the International Rotary Machine Co., of Berlin, Germany, and London, England.
Taking up his residence in the United States, Mr. Ungar became, in 1911, Sales Engineer for the SKFC Ball Bearing Company; and, in 1915, Chief Engineer and Technical Director of that Company. Since 1919, he has been engaged in consulting practice in New York City.

Analysis of Bearing Requirements in General—It is essential that the following factors determining the selection and design of bearings for electrical machinery be carefully analyzed.

(a) Normal and overload to be carried.
(b) The character of the load, whether steady or intermittent, with and without shocks.
(c) Normal and maximum speed.
(d) Frictional loss in its effect, both upon power losses and wear.
(e) Temperature rise from internal and external causes.
(f) Effects of wear upon performance.
(g) Adjustment in case of wear.
(h) Consumption of lubricant.
(i) Effect of leakage of lubricant.
(j) Presence of dirt or water and its effect upon bearings.
(k) Shaft deflection and bearing misalignment.
(l) Available space.
(m) Noise considerations.

(n) Manufacturing costs.
(o) Assembling and disassembling conditions to make (1) electrical and (2) bearing repairs.
(p) Repair and maintenance costs.

Friction of Plain Bearings—In order to correctly design and manufacture plain bearings, an understanding of the laws of bearing friction and the theory of lubrication is essential In all plain bearings whether of the radial or axial (thrust) type it is necessary to distinguish between dry or solid friction of the journal and bearing surfaces and the viscous or fluid friction of the lubricant forming a film between journal and bearings. Either condition may exist alone or in combination as semi-fluid friction.

Dry or Solid Friction—When dry surfaces are moved relative to each other under pressure friction resistance has to be overcome, owing to the greater or lesser roughness of the surfaces and the abrasion of the softer by the harder material.

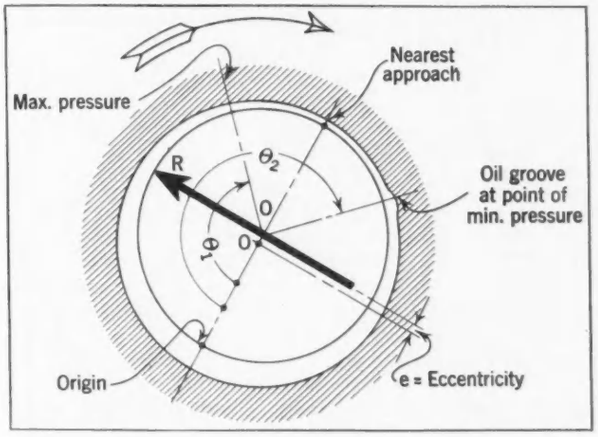


Figure 1

A diagrammatic representation of the resultant force exerted by the journal upon the oil film. The arrow indicates the direction of rotation and the eccentricity is the distance between the centers of journal and bearing

The following laws have been determined for solid friction:

(a) It is directly proportional to the total pressure between the surfaces.
(b) It is independent of speed variation at slow speed.
(c) It decreases at very high speeds.
(d) It is independent of the surface area.
(e) It is dependent to a considerable extent upon the roughness and hardness of the surfaces. For soft and rough surfaces it is higher than for hard and smooth surfaces; this applies both to sliding and rolling friction.

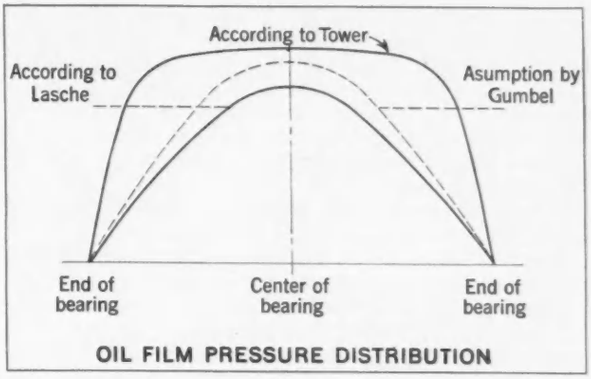


Figure 2

The pressure variation in the oil film of a journal for different bearing pressures and for two different methods of oil circulation

The properties of the bearings used in electrical machinery in regard to dry friction are of importance chiefly in the event of total failure of the lubricant supply, since then the extent of dry friction and consequent generation of heat will determine the amount of wear and possible damage to, or failure of the dry bearing. In this connection three principal factors have been outlined by Dudley as far back as 1892 and recent tests have confirmed them.

(1) Metals suffering maximum distortion without rupture, develop the least wear.
(2) With a bearing metal of the characteristics outlined under (1) an increase in tensile strength will add to its wear resistance.
(3) Of two metals having the same tensile strength and elongation, the one with finer grain structure develops less wear. In other words, wear resistance depends on both hardness and toughness.

In view of the fact that the tensile strength of metals decreases with increasing temperatures, the wear resistance at high temperatures is less than at lower temperatures. It is an important fact that surfaces acting as bearings are almost never in the state of perfect cleanliness. Chemically clean surfaces in relative motion in many instances will quickly wear and seize (i. e. weld themselves together). Practically every bearing surface, fortunately, is covered with a thin coating of a somewhat greasy nature derived, from lubricants, remnants, action of air, moisture and

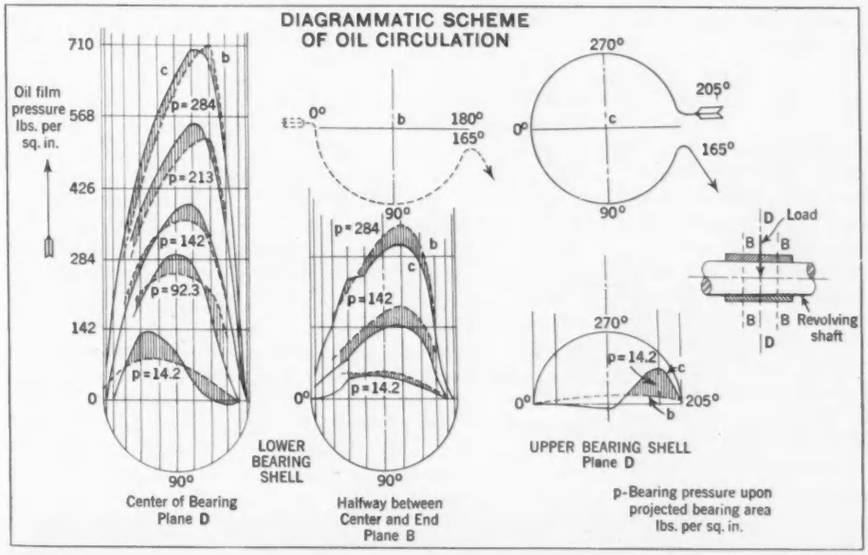


Figure 3

THE reduction in oil film pressure toward the bearing ends according to different authorities. This indicates that the carrying capacity of a bearing is only part of what it would be if it were possible to keep the ends closed

other impurities, which assist to a certain extent in reducing wear at least if the bearing pressures are slight.

The coefficient of dry friction varies from about 0.14 to 0.25 and over, depending upon the laws of solid friction outlined already. If a solid lubricant is interposed between the dry bearing surfaces it tends to fill up pores and inequalities of the surfaces and to form a thin film of solid lubricant. The result is a substitution, depending upon the extent of the formation of the solid lubricant film, of the friction of the metal surfaces by that of the solid lubricant which is materially less. This also results in reduced wear of the bearing surfaces which is a pronounced advantage for installations where lubrication of the bearings is likely to be neglected. Solid lubricants are used in the form of graphite (flake or artificial), talc, mica, etc. While undoubtedly beneficial in their friction reducing properties, they have to be carefully selected for purity and grain size in order to reduce abrasion to a minimum. It is interesting to note in this connection that flake graphite appears to have a certain dulling effect upon abrasive when used in dry form by interposing itself between the abrasive and the metal surfaces. In mixtures of graphite and abrasive used with a large excess quantity of oil, due to the solid matter being more or less in suspension, the dulling action of graphite is not apparent.

Semi-Fluid Friction (Mixed or boundary lubrication)—This frictional condition is always present with the relative movement of lubricated surfaces as long as the oil film between them is not capable of separating the metallic surfaces. (See below under fluid friction.) Semi-fluid friction is therefore always present when starting a bearing from rest, with imperfectly lubricated bearings (wick or grease lubrication), with excessive surface pressures, at slow speeds, or with oscillating shafts, in flat thrust washers; furthermore, in sleeve bearings due to misalignment, imperfect bearing fits or oil grooves improperly placed on the loaded side of the bearing.

The coefficient of boundary friction varies from 0.02 to 0.1 and over, depending upon the greater or lesser amount of fluid friction present. In spite of extensive experimentation it has not been possible as yet to formulate definite laws governing boundary lubrication. This is due to the fact that it is composed partly of dry and partly of fluid friction. The lubricant employed should possess the property which has been termed oiliness, which is more important for the reduction of boundary friction than viscosity. Vegetable and animal oils possess the property of oiliness to a high degree which is attributed primarily to the fatty acid content. The addition of solid lubricants to the oil has also been resorted to with a view to increasing oiliness. In order to be satisfactory, such solid lubricants should adhere to the bearing metals. The layer thus produced on the bearing surfaces should be smooth and oily. Both flake and artificial graphite have these properties to a greater extent than talc and mica.

Flake graphite appears slightly preferable to artificial graphite from the standpoint of oiliness. Artificial graphite, however, is practically free from abrasive impurities and remains suspended as colloidal solution in pure lubricating oil. This colloidal mixture of graphite and oil is, however, affected even by traces of acids and alkalis which cause precipitation or separation of the solid lubricant from the oil in which it was diffused. Furthermore, water introduced into a colloidal mixture of oil and graphite causes emulsification of the colloidal graphite with the water.

It will be seen from this that it is inadvisable to use solid lubricants in connection with circulating oiling systems, since in spite of their otherwise beneficial properties in reducing solid and boundary friction, there is always danger of clogging the passages, thereby stopping oil circulation entirely. However, where failure of the lubricant supply may be possible, graphitic solid lubricants in conjunction with grease, finely ground pure flake graphite of 150 mesh or less continually agitated in oil or artificial graphite in conjunction with pure mineral oils should give satisfactory results. Bearings which are inclined to run hot will be particularly benefited by solid lubricants. It is important, however, to point out that in a properly designed bearing in electrical machinery there is very little reason to fear hot bearings, excepting in cases of flagrant neglect.

In the choice of lubricants for surfaces with boundary lubrication, a compromise has to be made between the requirements for minimum fluid friction and minimum wear. For high speed bearings operating under low pressures, the principal requirement is low fluid friction, consequently oils of low viscosity with sufficient oiliness, should be used. Low speed bearings operating under high pressure requiring minimum wear should be lubricated

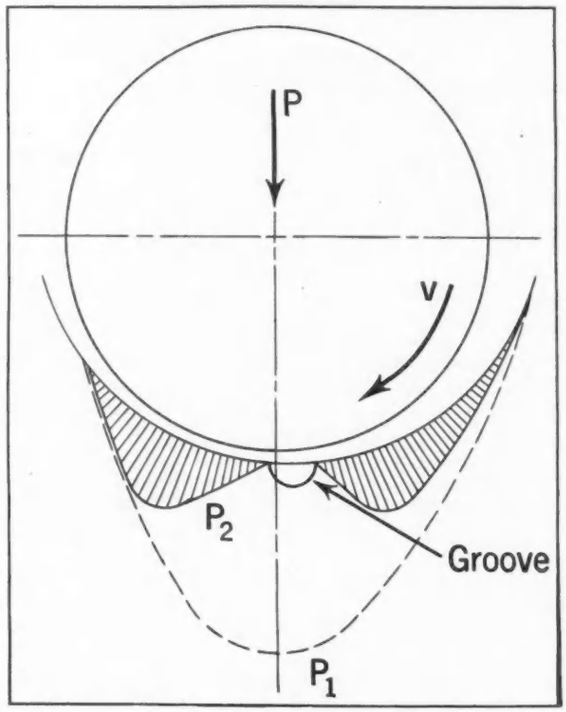


Figure 4

In this diagram the dotted line shows the oil film pressures along an open journal bearing without an oil groove, while the full lines indicate the oil film pressures with an oil groove at the point near the maximum oil film pressure

with viscous oils of the highest degree of oiliness. Fixed oils such as castor or rape oil also viscous mineral oils with traces of fatty acid or with suspended graphite as above outlined, will be found advantageous.

In view of the presence of dry friction, boundary lubrication always develops wear on shafts and bearings. The factors influencing wear are the same as those for dry friction. The lowest possible frictional resistance as well as absence of wear is possible only with fluid friction (complete film lubrication.)

Fluid Friction—If a lubricant is introduced as a medium to transmit pressure between two bodies, acting as journal and bearing, it eliminates direct contact between the bearing surfaces and at the same time solid as well as semi-fluid friction. That the lubricant remains between the bearing surfaces is due to its viscosity as well as to its ability to adhere to the materials chosen as surfaces for journal and bearing. The frictional resistance under these

(*Continued on page* 68)

Rod and Wire Forming Data and Methods

In the following, which is the third of a series of articles, the author gives considerable valuable information about forming rods and wires

By J. K. Olsen

Chief Draftsman, Stewart-Warner Speedometer Corp.

IN the previous examples and descriptions of plain, straight wire or rod stock parts, the blank length was found to be the length of part plus the width of cut-off tool (when used), and the only factors to be considered in estimating the raw material requirements were these simple items.

The previous examples and descriptions are important in consideration of various parts, such as gears, shafts, bushings and the multitude of other parts which are made from straight blanks; however, we now come to a series of bent parts and it will be necessary to consider more factors in obtaining the developed length of raw material blank.

In Figure 7 is shown a rectangular bent rod with a ¼ × 1-in. cross section. This rod is formed over the narrow cross section as is mostly the case in this kind of part.

The part, developing, and material layout are shown in regular manner.

The developed length is obtained in the following manner:

B = (K + ½ T) × constant for angle B (17°)
D = (L × 1/3 T) × constant for angle D (69° 30′)
F = (M + 1/3 T) × constant for angle F (81°)
H = (N + ½ T) × constant for angle H (73° 30′)

Transposing the above we have:

B = 0.750 × 0.2967 = 0.2225
D = 0.458 × 1.213 = 0.5556
F = 0.333 × 1.4137 = 0.4708
H = 0.625 × 1.2828 = 0.8018

The rest of the lengths can be taken directly from the calculation.

Developed length is:

A + B + C + D + E + F + G + H + J = 0.375 + 0.2225 + 0.750 + 0.5556 + 0.500 + 0.4708 + 0.375 + 0.8018 + 0.250 = 4.3007.

Raw material length = Developed length + cutoff = 4.3007 + 0.200 = 4.5007 or 4½ in. long.

The weight per 1000 pieces of this part, providing it was made from steel would be A × W × 7.292 = 4.5 × 10.2 × 7.292 = 334.7 or 335 lb. per 1000 pieces.

As can be seen in this example, the two large radii K and N are figured by using one half (½) the thickness of stock plus the inside radius. The two smaller radii L and M are figured by using one third (1/3) the stock thickness plus the inside radius and are obtained from the following rule: When the inside radius of the bend is twice or over twice the thickness of the stock, the developed length of stock should be figured on a line ½ from the inside edge of stock. In the same manner when the inside radius of bend is less than twice the stock thickness, the developed length of stock should be figured on a line 1/3 from the inside edge of stock.

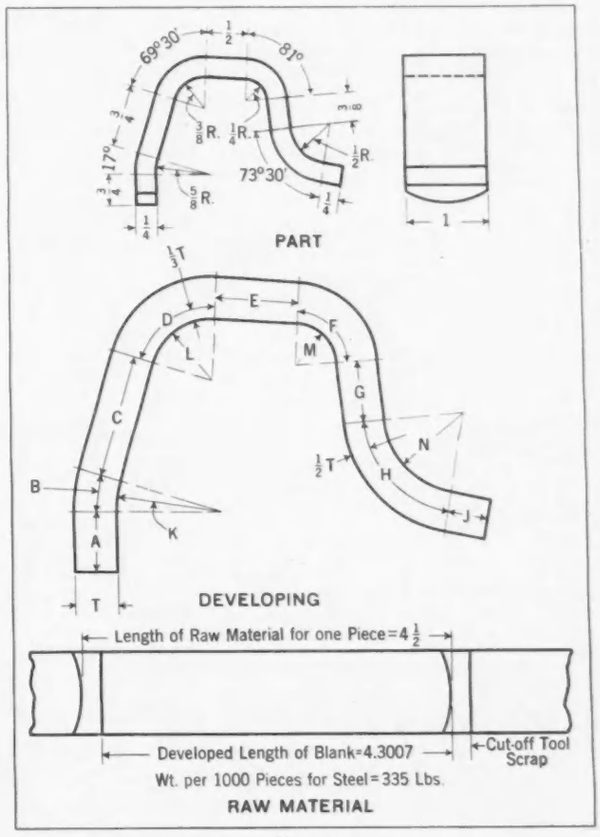


Figure 7

A typical example of one of the difficult problems met in the forming of rods and wires. While this part is not particularly complicated, it illustrates what is necessary in the way of temporary layouts to obtain best results

This method is different in cases where round rod stock is used instead of flat rod stock. Almost always the de-

veloped length is figured on the centerline or in other words one half (½) stock thickness is used for figuring developed length of radius for round stock.

The cut-off tool in this example is made 0.200 in. on the narrowest point of the circular cut-off which is less than the thickness of stock (80 per cent) which should in this condition be a good practical allowance.

If the part were sheared straight across and a cut-off tool used, the chances are that this cut-off allowance would have to be increased slightly. However, if just a plain shearing operation were used, no cut-off allowance would be necessary.

The formula used for figuring the weight is described under "Simplified Method of Figuring the Weight of Sheet or Strip Stock."

In estimating raw material lengths in the manufacture of headed parts, the length of the blank is obtained by using the volume process. The volume of metal required to form the headed portion of the part is added to the volume of the metal in the straight portion and the sum of the two will be the volume of metal in the blank. It may readily be seen by referring to Figure 9 that the head or swaged portion of the part is provided for in the length of the wire.

The total amount of material required for a given number of parts may be found by multiplying the length required for one part by the number of parts required and adding 5 per cent of the result to take care of waste material.

A short cut in determining the weight per 1000 pieces for any kind of rod stock is hereby given.

The formula is simply to multiply the length of raw material required for one piece by the weight per linear foot and multiply this result by the constant 87.5.

L = Length of one piece plus width of cut-off tool

W = Weight per linear foot of raw material

87.5 = Constant

Formula for weight per 1000 pieces = $L \times W \times 87.5$

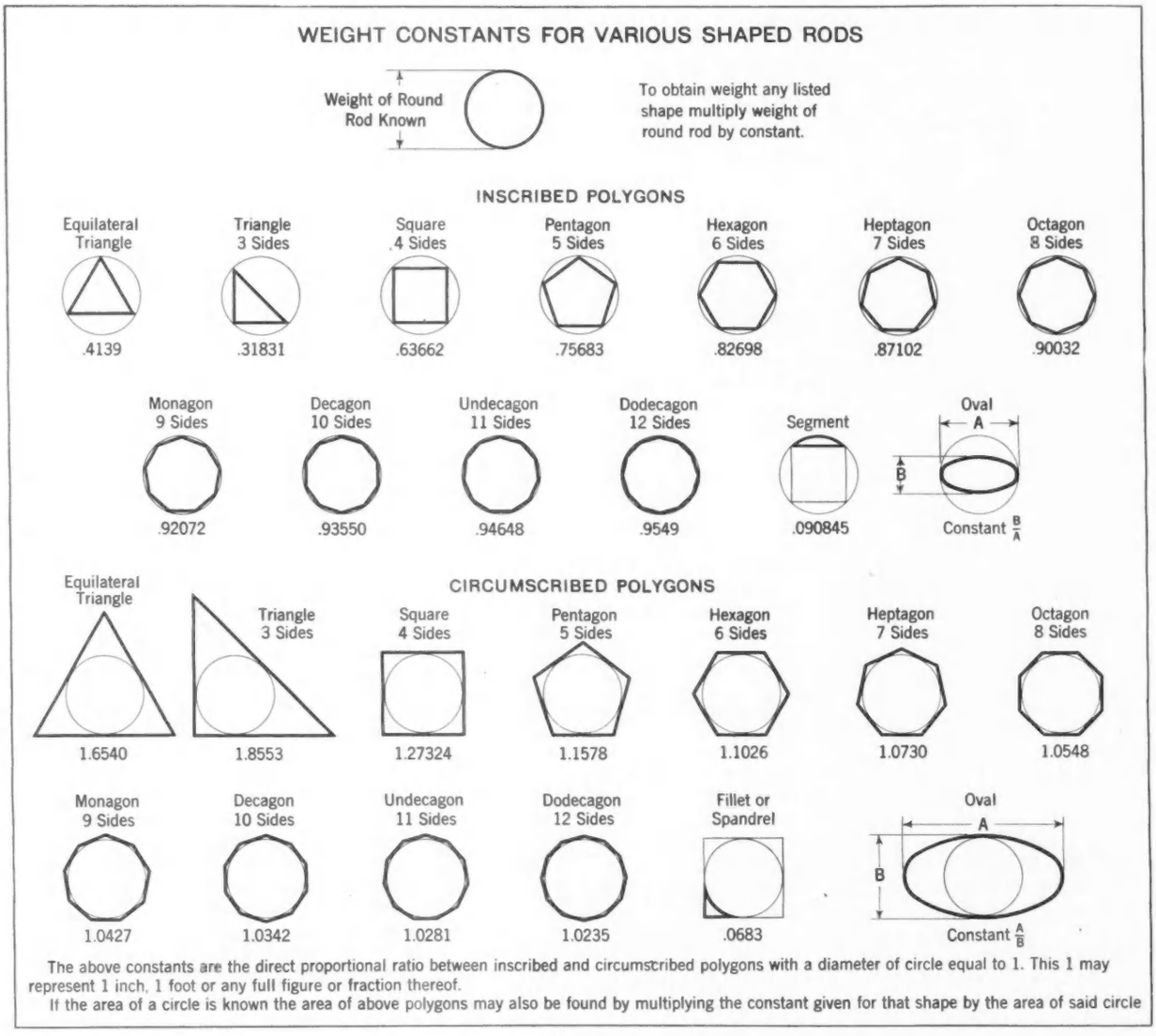
This formula includes 5 per cent for scrap.

Note that the length includes the width of cut-off tool.

The formula is obtained from the following factors.

$$L \times W \times \frac{1000}{12} \times 1.05 = L \times W \times \frac{1050}{12} =$$

$$L \times W \times 87.5$$



The above constants are the direct proportional ratio between inscribed and circumscribed polygons with a diameter of circle equal to 1. This 1 may represent 1 inch, 1 foot or any full figure or fraction thereof.

If the area of a circle is known the area of above polygons may also be found by multiplying the constant given for that shape by the area of said circle

Figure 8

A series of inscribed and circumscribed polygons with a constant for each of the various shapes. These constants are the direct proportional ratio between a circle of any given size and the various inscribed or circumscribed shapes. These constants may be employed in the estimating of the weights of rods, bars and similar shapes in estimating various amounts of material needed

Example: The following is an example of the ordinary method of determining weights.

L = 2.0937-in. (2 + 0.0937)

W = 0.6676 (weight of ½ round steel rod per linear foot)

$$2.0937 \times 0.6676 \times \frac{1.05}{12} \times 1000 = 122.303 \text{ lb. or } 123 \text{ lb.}$$

Taking this same example and using the simplified method we have:

$2.0937 \times 0.6676 \times 87.5 = 122.303$

This would be made 123 lb., which brings the scrap allowance below 6 per cent.

All weights should be given in even amounts or main fractions except for special high cost material or exceptionally small weights.

Since a percentage allowance is given for scrap it should not be necessary to specify a fancy fraction or decimal for the total weight.

It should be remembered that in ordering the material for a production-run the amount is multiplied when ordering the raw material, and any chance of mistakes when doing this is a serious matter; a plain and even amount for the weight will undoubtedly avoid errors, besides a plain amount is easier and faster to use.

The 5 per cent weight allowance for waste is in some cases increased to 6 per cent and sometimes decreased to 4¾ per cent in order to use an even total weight.

Following is given an approximate table of "Even Amounts." These at the high or low dividing points are sometimes to the extreme but do however give a general idea of a practical method in determining the nearest rounded off total.

Table of Nearest Even Amounts in Pounds

Below 5 lb., use decimals

From	5 lb.	to	10 lb.	specify amount in	0.05 lb.	steps
From	10 lb.	to	15 lb.	specify amount in	1/16 lb.	steps
From	15 lb.	to	30 lb.	specify amount in	1/8 lb.	steps
From	30 lb.	to	60 lb.	specify amount in	1/4 lb.	steps
From	60 lb.	to	90 lb.	specify amount in	1/2 lb.	steps
From	90 lb.	to	200 lb.	specify amount in	1 lb.	steps
From	200 lb.	to	500 lb.	specify amount in	2 lb.	steps
From	500 lb.	to	1,000 lb.	specify amount in	5 lb.	steps
From	1,000 lb.	to	2,000 lb.	specify amount in	10 lb.	steps
From	2,000 lb.	to	5,000 lb.	specify amount in	25 lb.	steps
From	5,000 lb.	to	10,000 lb.	specify amount in	50 lb.	steps
From	10,000 up				100 lb.	steps

In this table it should be noted that, with the exception of weights below 10 pounds, all fractions used are multiples, in ounces and whole numbers.

The table should be used in specifying weights for all raw materials such as rod stock or sheet stock, etc.

The weight is determined in the usual way in order to specify an even amount on the drawing. Suppose a weight amounted to 25.130 lb. and by using the table we find that from 15 to 30 lb. weight should be given in ⅛-lb. steps. Therefore, the weight 25.130 lb. would be made 25⅛ lb. still leaving a scrap allowance above 4¾ per cent. We will now assume that a weight equalled 28.157 lb. This weight would have to be increased to 28¼ lb. which would still be below 6 per cent for scrap. This weight, could not be decreased to 28⅛ lb. since it would then allow less than 4¾ per cent for scrap.

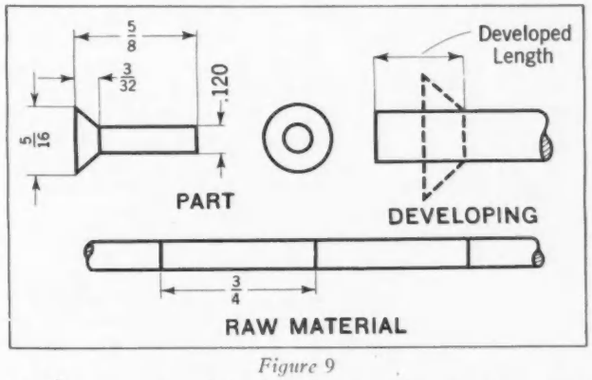


Figure 9

Here is an example of the procedure in determining the amount of material required for making a formed part having a swaged head. Notice again that the first step is that of making a layout

In Figure 8, a series of figures of inscribed and circumscribed polygons a comparative constant is given for each different shape. These constants are the direct proportional ratio between a circle of any given size and the various inscribed and circumscribed shapes.

The constants given for these shapes may be used to advantage in determining the weights of rods, bars, etc., of the various shapes shown. To determine the weight of stock per foot for any one of the shapes, first determine the size of the circle about, on inside of which the shape is circumscribed or inscribed and when this diameter is obtained, the next step is to find the weight per foot of rod of the desired material and the previously obtained diameter. The weight per foot of rod stock may be found in various tables, hand-books, etc. The final step in computing the required weight is to multiply the weight per foot of material by the constant given under the shape and the product of these two items will be the weight desired.

For a comparison of the difference between weights of the various polygons and round materials the following table is given, the round rod being 1 in. in diameter and 1 ft. long in comparison to 1-ft. lengths of the other shapes.

The weight of 1-in. round rod, 1 ft. long as used in the table is as follows: Aluminum 0.9095 lb., brass 2.8989 lb., and steel 2.670 lb.

The values in the table were computed by multiplying the constants given for the shapes by the weight of round rod.

Example of an equilateral triangle (inscribed)

The constant (0.4139) × wt. of aluminum rod, (0.9095) or 0.4139 × 0.9095 = 0.3764 = wt. per foot of triangular aluminum rod.

Inscribed Polygons
Weight in Lb. Per Foot

Equilateral	Triangle	Constant	Alum.	Brass	Steel
3 sides		0.4139	0.3764	1.1999	1.1051
Triangle	3 sides	0.31831	0.2895	0.9227	0.8499
Square	4 sides	0.63662	0.5790	1.8455	1.6998
Pentagon	5 sides	0.75683	0.6883	2.1940	2.0207
Hexagon	6 sides	0.82698	0.7521	2.3973	2.2080
Heptagon	7 sides	0.87102	0.7922	2.5250	2.3256
Octagon	8 sides	0.90032	0.8188	2.6099	2.4039
Monagon	9 sides	0.92072	0.8374	2.6691	2.4583
Decagon	10 sides	0.93550	0.8508	2.7119	2.4978
Undecagon	11 sides	0.94648	0.8608	2.7438	2.5271
Dodecagon	12 sides	0.9549	0.8685	2.7682	2.5496
Segment		0.090845	0.0826	0.2634	0.2526

Circumscribed Polygons
Weight in Lb. Per Foot

Equilateral	Triangle	Constant	Alum.	Brass	Steel
3 sides		1.6540	1.5043	4.7948	4.4162
Triangle	3 sides	1.8553	1.6874	5.3783	4.9537
Square	4 sides	1.27324	1.1580	3.6910	3.3996
Pentagon	5 sides	1.1578	1.0530	3.3563	3.0913
Hexagon	6 sides	1.1026	1.0028	3.1963	2.9439
Heptagon	7 sides	1.0730	0.9759	3.1105	2.8649
Octagon	8 sides	1.0548	0.9593	3.0578	2.8163
Monagon	9 sides	1.0427	0.9483	3.0227	2.7840
Decagon	10 sides	1.0342	0.9406	2.9980	2.7613
Undecagon	11 sides	1.0281	0.9351	2.9804	2.7450
Dodecagon	12 sides	1.0235	0.9310	2.9670	2.7327
Segment		0.0683	0.0621	0.1980	0.1824

(To be continued)

That "Last Ounce" in Good Factory Control

(*Continued from page 27*)

one lateness in 10,000 chances. That is, with 5000 employees reporting to work in the morning and again at noon, anything in excess of one late per day is below bogey. And the remarkable fact is that some of the plants have shown that it is possible to hit bogey for several months in succession.

The test for Order and Cleanliness includes the condition of walls, floors, ceilings, columns, windows and all other important details. One result of it is that in the machine division the machine shop floor compares favorably with that in the office of the president of the company.

A bogey that would arouse considerable discussion wherever it was proposed is that for Accident Prevention. It is based on number of visits to the plant hospital, and the idea behind it is that a simple scratch is just as undesirable as a serious accident.

An important point is that no bogey is permanent. With the approval of all concerned, higher standards are set when experience indicates that their achievement is possible. This makes for continuous progress.

A part of Point II, as outlined above, is that with each bogey there should be "simple measurements whereby it may readily be determined, monthly, how close a plant has come to each bogey." The system of points and penalties used in reckoning Customer Service standing has been described. A somewhat similar method of scoring covers the Quality scores, with progressively severe penalties for minor defects, serious defects, and "dads."

III

By the 15th of the month each Westinghouse Lamp production executive knows what score his plant made the previous month in each of the bogeyed items.

Some items are known by the 10th.

And by the 20th each executive has the proof of the pudding in the form of a bonus check.

IV

Step into the general manufacturing office, and the first thing that catches your eye is a pair of display boards on which are some dozens of red stars, white stars and blue stars. The label they bear is "Measuring Management: 1929."

Honor where honor is due, and plain notice when performance in any one particular is unsatisfactory.

A white star means "lily white" performance—the achievement of bogey. A blue star is fair performance—but not bogey. Red: in trouble.

But bear in mind that, under the consistently high standards set, a red star might indicate a performance of better than 95 per cent—even 99 per cent—of possibilities. In warehouse inspection, for instance, a white star means that 985 points out of a possible thousand have been achieved. To earn a blue takes 955 or better. Consequently a score as high as 954 might draw a red star. And, when it is considered that, with the progressive penalites used in the reckoning, a score of 954 might actually result from deficiencies in less than one per cent of the lamps manufactured, the effectiveness of the star system as a management alarm clock can readily be seen.

Each horizontal row of stars on the board stands for achievement in respect to Warehouse Inspection, Cost vs. Budget, or another one of the items for which bogeys have been established.

Each of the two boards at headquarters contains the record of four plants. But at each plant there is a similar board which displays the honors achieved by that plant.

The critical eye of the visitor looks first for red stars. And if a horizontal row of several reds is found, it will be noticed that it soon shifts to blue or to white. Red rows don't stay red.

Or let a white row shade off to blue for a month. Usually it comes back to white immediately. For that one blue star means that an entire plant has its pride threatened.

This open display of stars, for honor and for warning, is in some ways the most effective part of the whole set-up, in stimulating balanced management.

The month-to-month and year-to-year effect upon the plant's management as a whole is apparent.

Problems Almost Automatically Solved

At Westinghouse Lamp Company, the result of Measuring Management appears to have been the leveling of one problem after another, almost automatically.

It is true that much progress was previously made in most if not all of the items now controlled by the boards. But after the first and most obvious peaks are leveled, progress is under ordinary circumstances likely to be spasmodic and scattered. With the Measuring Management boards in effect, progress is more likely to be well directed and continuous. There is less need for "drives" and "campaigns," which Westinghouse Lamp executives regard as liable to be temporary in their effects, and often productive of reaction. As one of them puts it, the boards lead to "365 day attention to all the important problems of management—and that is the kind of attention that is needed."

In the Westinghouse case the definite rating of a plant, both through the use of the stars on the boards and by the summary of its bogey-performance figures, is the most effective part of the whole idea. Because of it, a plant manager and his assistants know exactly where they stand at all times. If their record is good, they know there is nothing headquarters will refuse to do for them in any way of making a continued good record possible. The superintendent who is a good manager in most particulars but has one or two bad spots in his record is likely, in any company, to have some difficulty in "selling" his ideas about new equipment, for instance, to those to whom he is responsible. But the superintendent with a board full of white and blue stars knows, and his superiors know that he has been saving the company a good many thousands this year. So if he sees an opportunity to save still more by some plant improvement, his ideas command respect.

Likewise the man with the bad spots in his record doesn't go along from month to month hoping they are being overlooked. He knows they are not, and acts accordingly. And in the end no one gets more satisfaction out of it than he himself.

V

In the Westinghouse case, the plant superintendent gets no direct financial reward for the improvement of his record of Measured Management. His rewards come in other ways.

Every executive in his plant who can contribute to a better showing does profit, however, from each improve-

(*Concluded on page 72*)

With the Editors

Help Uncle Sam Do This Work

WITH the assistance of a committee of twenty-five men prominent in industrial and commercial activities, the Department of Commerce is planning to make the forthcoming Census of Manufactures one of great practical value to manufacturers throughout the country. This Advisory Committee was appointed by Secretary Lamont. The chairman is Col. L. S. Horner, president of Niles-Bement-Pond Company. The functions of the committee will be to draw up the schedules of the 1929 Census of Manufactures, to decide upon the subsequent tabulations to be made, and to lend their advice and influence in every way to the success of the census.

Electrical manufacturers of all kinds, in common with all other manufacturers, will, of course, be called upon to cooperate. This request by the Department of Commerce, through its Census Bureau, for the assistance of manufacturing executives should not fall upon indifferent ears. Indeed, the electrical manufacturing industry should see in this census a live opportunity to obtain facts and figures which our manufacturers have always wanted but which have never been available. Rather than wait for the census man to come around and start asking questions, would it not be better for leaders in this field to get into action at once and throw positive and constructive thinking into the task to be accomplished, in order to reap later the largest possible benefit from the data collected? It might not be amiss to suggest that Nema appoint a committee, representing the electrical manufacturing field, to cooperate in every possible way with the advisory committee appointed by the Secretary of Commerce.

Nema in the Spotlight

MEMBERS of the National Electrical Manufacturers Association are assembling at the Wardman Park Hotel, Washington, D. C., for their annual meeting, as this issue of ELECTRICAL MANUFACTURING goes to press. Heretofore Nema has held its annual meeting in the spring. The change marks an effort by the association to hold its most important meeting at a time when it is not in conflict with the many conventions and exhibitions that are usually scheduled for May and June. Under the new plan the management of the association believes that the present meeting will be the largest yet held. And in view of the importance of the questions to come before the meeting, it will be second to none.

New activities which may have far-reaching consequences are under consideration. If indorsed, they will be supported by the revenue obtained from the recent doubling of the secondary dues for a period of one year.

Trade practice conferences are scheduled for seven industry groups represented by the mica, panelboard, outlet box and conduit fittings, flexible cord, vulcanized fiber, and carbon sections of Nema. These are the first trade practice conferences to be held in the electrical industry. The experience of the association in holding the conferences and the results of them will, it is hoped, encourage other groups in the industry to utilize the same method of adjusting difficult questions arising from time to time.

What Nema does at Washington will be of importance not only to its own members, but to non-members as well, and to the entire electrical industry for that matter. The association is now three years old; it has shown excellent growth and substantial achievement. Its prospects are brighter today than ever before. Under continued wise leadership, it should become an increasingly powerful agent in the development of the electrical industry and its service to mankind.

How Many Appliances Will a Woman Buy?

SOMEONE has recently asked this question: Is the manufacture of electrical cooking appliances for the home being carried to the point where a woman is asked to buy too many one-purpose appliances, that is, appliances that are designed or intended to cook or aid in the preparation of *only one kind of dish?* Or, to put it in another way: Is the woman in the home asked to make too heavy an investment in appliances of infrequent use, and to provide an increasing amount of kitchen storage space for them? Or is she being asked to load too many appliances on her table for one meal?

It is a fair question. It is not necessary to name a list of one-purpose appliances. Anyone can name a number of them. And mention of such an appliance here is not a reflection on its value to the home. Take the drinkmixer. Does its use during the heat of summer, for cooling drinks now and then, justify its purchase? Or does the family during a year drink enough orange juice or lemonade to justify the purchase of a fruit juice extractor? Or does the average family eat enough waffles in cold weather to justify the purchase price of an electric waffle iron? And so on.

Of course manufacturers of these and many other appliances will spring up and point out that too many women in the home fail to make the most use of even a one-purpose cooking appliance. That may be true, probably is. In that case these manufacturers certainly have a live educational task on their hands. No one in the industry doubts the ability of the manufacturer to justify his own product.

Nevertheless, it must be remembered that the woman who is intelligent enough to use electrical appliances and able to pay for them is also intelligent enough to avoid a too frequent repetition of the same dishes served to her family. Variety is a veritable necessity in her family's meals. She is going to think twice before she invests in an appliance that will cook only one kind of food. She is not likely to put her money into cooking appliances that stand idle most of the time. And if this is true of the woman in the comfortable financed home, it is true of the woman of small means.

In other words, would it not be the logical move, in selling cooking appliances to the homemaker to sell first the kind of appliance that has a variety of uses, that will perform a number of different operations? Perhaps more appliances of this kind are needed. If so, certainly here is an opportunity for the inventive genius of our manufacturers to exercise itself.

Characteristics of Electrical Control Apparatus

The first instalment of a discussion of the properties and functions of various types of electrical control equipment and their different applications

RALPH G. LOCKETT
Cutler-Hammer Mfg. Company

IMPROVEMENTS and advances in our industries can be measured to a great extent by the increasing application of electric power. The application of electric power can, in the same way, be measured by developments in the art of controlling electric motors.

Electrical power in itself is a very inflexible thing and the layman is continually astonished and amazed by the apparently miraculous things that electric motors can be made to do.

However, it is not so apparent to the casual observer that electric power is inflexible. The desired functions are usually obtained by combining a motor drive with a machine. Yet it is only through the medium of specialized control devices that motors perform the highly diversified and useful duties required of them.

The proper application of electric control so vitally affects its design that the application must be considered as a part of the design. A brief analysis of any control problem shows that the same elements are present to be dealt with. These are the machine to be driven, the driving motor, the power, the control, and the operator. The machine represents the problem to be solved, and the other four elements give us the solution. The motor does the work required by the machine, the control itself controls the flow of power to the motor, and the operator initiates the different functions to a degree which varies with conditions.

Of the five elements mentioned, the machine, representing the product or process, is a known quantity. It can be taken for granted that this part of the problem is fixed. The first consideration in the application is the power supply. For example, a constant speed requirement with infrequent stops is more apt to lead to a choice of alternating current, and a requirement for flexible handling is more apt to lead to the use of direct current. After choosing the kind of power, the motor falls into one of the two principal types, i. e., for alternating or direct current.

Other considerations, of course, affect the choice of both the motor and the control. The particular industry being dealt with may have peculiar requirements. Steel mills will demand reliability and long life, with freedom from interruption. Mines, the Navy, the dyeing and laundry industries require special protection against dampness. Elevators must be exceptionally quiet. Certain steel mill operations produce a light metal scale which causes trouble unless precautions are taken. Power stations demand continuity of service and over capacity. Selling factors are the determining consideration in many forms of simpler control. These, and many other factors enter, and may alter the original choice, where the preferred type will not meet some peculiar condition.

After the kind of power is known, the designer picks the motor. The motor is so closely associated with the control that a tabulation of the common types with a brief summary of their characteristics and common uses is of value:

Direct Current	Alternating Current
Series	Single Phase
Series Shunt	Squirrel Cage Polyphase
Shunt	Slip-ring Polyphase
Compound	Synchonous (Self-starting)
(a) Constant speed	Rotary Converters
(b) Variable speed	Special Asynchronous Machines

Taking up these forms of motors in turn, we start with:

Series D. C. Type—The speed of a series D. C. motor varies with the load applied, and on no load such a motor tends to run away. Hence, such motors are never applied to loads which reach zero or to which they cannot be rigidly coupled. For example, a series motor would not be coupled to its load with a belt, (which might break or come off and cause a disastrous runaway), nor would it be used in an application where variation in speed, due to changes in load, would be objectionable. Without doubt, the widest application of the series motor is in the traction field, where its high starting torque and ability to divide load and adjust itself to changing load makes it supreme. A somewhat similar application with which you are no doubt more familiar, is on ordinary shop cranes where the series motor can be used on all three motions. Here special circuits are often used on the hoist to take care of overhauling loads and lowering an empty hook.

Series Shunt—This motor is really a series motor provided with a light shunt field winding. This shunt winding provides enough field flux at no load to hold the no load speed to a suitable value. This motor finds a wide application in steel mills where heavy starting torques are particularly desirable and where some dynamic braking is required.

Shunt Motor—The straight shunt motor, possessing only a single shunt field winding, is best known for its ability to hold a nearly constant speed throughout the load range of its rating. And coupled with this constant speed characteristic is another—its limited starting torque. Because its field is excited by a simple shunt winding, the field flux is constant. The torque is proportional to the armature current and field flux, and hence the starting torque is limited by this constant value of field flux. For this reason the true shunt motor finds a very limited field except in the

smaller ratings, and its principal defect has led to the widespread use of the compound motor.

Compound Motor—The compound motor represents a happy combination of the shunt and series motors, retaining most of the good features of both. A series winding added to the shunt field of the shunt motor carries the main armature current, and the flux, due to the series turns, varies with the load, and is greatest at starting. By this combination a fairly constant speed motor is secured, but the starting torque is considerably higher than that of the straight shunt machine. Upon occasion a "stiff" series field is provided, but is shunted from the load circuit on the last point of the controller. Figure 1 shows various D. C. motor characteristics.

Alternating Current—The single phase motor in its most familiar form is of the split field type and can be reversed when at rest only. There is, ordinarily, little requirement for reversing these motors. The repulsion type is manufactured in special forms for reversing.

Small single phase motors are found on fans—small pumps, blowers, sewing machines, etc., especially where the small power requirements do not justify the expense of polyphase circuits.

The polyphase squirrel cage motor is a very well known type. With no moving or sliding contacts, and an exceptionally rugged rotor, it has a wide application difficult to classify.

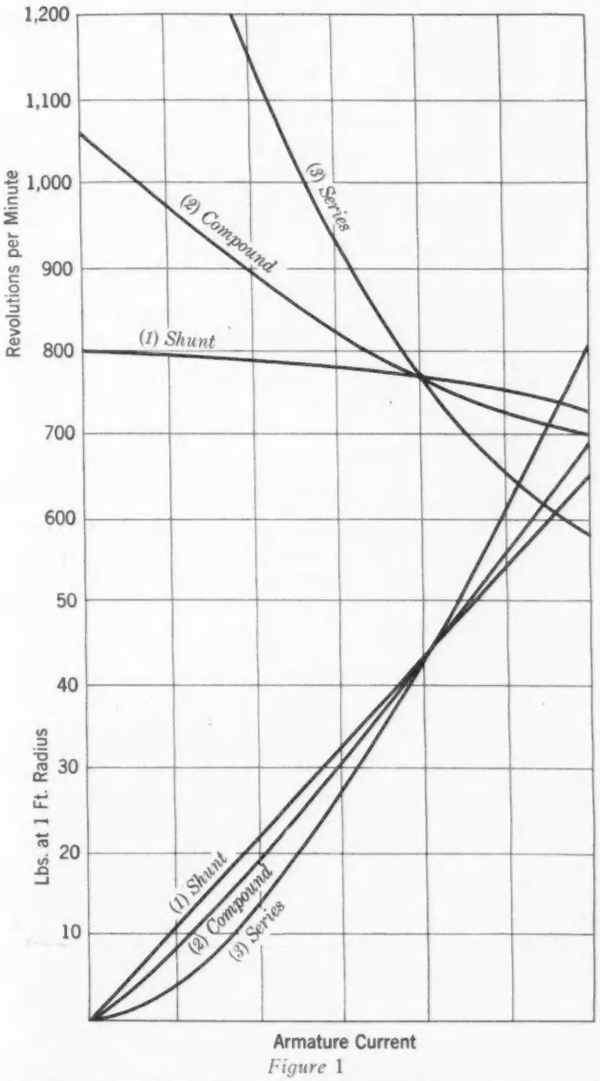


Figure 1

A diagram showing the various characteristics of direct current motors, as to armature current and revolutions per minute of the shunt, series and compound types

Squirrel cage motors are used on rubber mill drives where the load can be cut off during starting, as with a clutch brake. They also find a wide application on tire machines where the absence of moving contacts in close proximity to inflammable vapor is a decided advantage. They require high values of current in starting and unless applied so as to be fully loaded, operate at an unsatisfactory power factor. They are constant speed machines, and with starting characteristics none too good, are not found in as varied applications as the slip ring motor, whose structure provides an opportunity to vary the resistance of the secondary and thus vary the torque and speed.

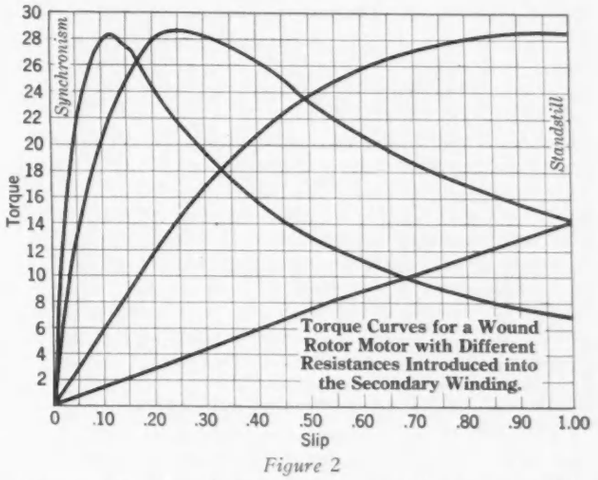


Figure 2

A diagram showing what happens to a wound rotor motor when external resistance is introduced and the value varied. The lowest curve does not reach its maximum until negative speed

The maximum torque of any induction motor is proportional to the square of the impressed primary voltage. The maximum torque is independent of the resistance in the secondary winding, but the speed at which this torque is obtained varies directly proportional to the secondary resistance.

The squirrel cage motor is deficient in starting torque for many installations such as Banbury mixers—mill lines without clutches, etc. If the squirrel cage resistance is made high enough to provide proper starting torque, the efficiency under load is too low. While several expedients are available, the most common method of securing high torque at starting is to put a slot winding on the rotor, lead this winding to slip rings and connect resistance to these rings. This gives us the standard slip ring motor.

Figure 2 shows what happens when external resistance is introduced and the value varied.

The lowest curve does not reach its maximum value until negative speed is reached. This means that the motor would exert maximum torque when driven backward by external power, and this might seem to have little practical advantage. An example may be of interest:

A quick acting regulating weir on a canal is ordinarily operated by a 600 r.p.m. slip ring motor. In emergencies it may be operated by a reversing water turbine on the same shaft at speeds as high as 2000 r.p.m. There is the chance that the motor may be energized in either direction while the turbine is at full speed. Therefore, the secondary resistor would be designed with these curves in mind.

Synchronous Motors—Power factor has been mentioned and this is a subject in itself. Briefly it is advantageous to have transmitted alternating current in phase with the voltage. Large groups of inductive motors and other inductive loads cause the current to lag behind the voltage. One

corrective measure is found in the operation on such lines of synchronous motors with overexcited fields.

So we find today an increasing application of sychronous machines in combination with inductive loads. The ordinary self-starting synchronous motor is really a combined squirrel cage and synchronous machine, the regular squirrel cage characteristics being used during starting and lost at the instant of synchronism. The squirrel cage winding, in this case, however, can be designed for the best starting characteristics without regard for the losses in it at running speed, because it automatically goes out of circuit at synchronism. The synchronous machine is not susceptible of speed control and must be provided with both alternating and direct currents.

A wide application for synchronous motors in the rubber industry is found on rubber mill lines, Banbury mixers, etc., where units run at constant speed for long periods of time. Such motors are capable of being stopped very quickly in case of emergency by dynamic braking or plugging.

This brief discussion gives some indication of the wide variation of characteristics available in the motors themselves. The various types of control can also be classified, but fall into somewhat different lines.

Types of Control—The division into the two major classes of control—manual and automatic, is linked with the operator, and the division of labor between the control and operator presents an interesting study.

A decision must be reached, and a compromise struck, on the most economical combination of operator's intelligence or reliability and the automatic control. An example comes to mind: A power company in Arizona was laying out a control for a 700-hp. slip ring starting motor directly coupled to a 10000-kw. frequency charger. By push-button, the operator could start from either the 60 or 25 cycle source and the set would automatically accelerate to slightly above synchronous speed and then slowly lose speed to a point slightly below synchronism. It was decided that the operator could manually synchronize at one of the two chances he would have. Further discussion developed that oil pressure was necessary in the bearings before the start button was pressed. Consideration was therefore given to whether the operator should be required to check the oil pressure before starting, and whether he or the control should deenergize the starting motor after synchronizing. In other words, the degree of dependence on the operator had to be worked out for each step. Similarly—on a calender train, in which two or more machines are synchronized, a decision must always be reached as to whether the machine speeds shall be regulated by hand from a pulpit or automatically, by dancer rolls.

Such problems are not always solved by engineers in the same way, because local conditions vary. This results in many variations of manual, semi-automatic and full automatic control, each designed for certain economic conditions. Control is no different than any other commodity and must pay its own way by the economies it effects.

Manual Controls—These are made in many familiar types beside face plates. Drums and multiple switch (or hand over hand) devices are common types. The drum is extremely simple and easily maintained and stands up well under rough handling. The multiple switch mechanism lends itself well to the handling of large horsepowers and high currents. All of these types can be adapted to either alternating or direct current motors.

Automatic Control—There are four principal types of this control:

1. Across the line
2. Time limit
3. Counter emf.
4. Current limit.

Across the line starters are used principally on small motors, where the resultant current inrush is small enough, compared to the power supply, not to cause excessive voltage disturbances. However, low speed self-starting synchronous motors can satisfactorily be thrown across the line. One thousand horsepower motors of this type are being started by this method in Akron.

Time limit starters depend upon some form of time-measuring device. Often a solenoid restrained by a dashpot or magnetic lag is used. A small motor can be used to time the contacts, if desired.

The counter emf. starter measures the voltage drop across either the motor or the accelerating resistor to actuate the accelerating devices. As the motor speed rises during starting, the voltage across it rises and that across the resistor drops. This change in voltage can be used on calibrated relays or contractors to close them at definite motor speeds.

Current Limit—In almost the same way, the changing current flowing in the motor circuit may actuate calibrated relays or contactors so that sections of resistor are successively cut out of circuit.

Time Limit Starters—These possess one advantage over current limit or counter emf. types because the motor is accelerated at the same rate regardless of the load. For example, on elevators, where the load varies within very wide limits, a current limit starter will accelerate a lightly loaded car too fast, and it might lock out on a heavy load and fail to accelerate the motor.

Another example is found in a calender train. Should one calender happen to be heavily loaded, it would tend to lag, in starting, behind the others, if equipped with a current limit starter.

A synchronized calender train with automatic dancer roll regulation is a good example of the type of installation requiring careful application of motors. The motors should have speed-torque characteristics which give curves of similar shape, and the field rheostats should be carefully designed.

Current Limit Controllers—There are two methods of obtaining current limit acceleration: 1—Self-contained contactors of the series and lockout type. 2—Series relay controlled contactors.

The relays or contactors on standard controllers are adjusted to operate at from 110 to 120 per cent of normal current.

Lockout Controllers—The virtue of series lockout contactor controllers lies in their simplicity. Practically no electrical interlocks are required, and they are less liable to coil trouble because series coils are used. Ease of adjustment is another decided advantage of this type.

The arrangement of the magnetic circuits is such that on heavy currents the pull of the lockout coil predominates. As the motor accelerates and the current falls, the pull of the closing coil is stronger and the contactor closes.

Series Relay Controllers—Series relay controllers are more complicated than any of the other standard types, because a series relay and a shunt contactor are required for each point of acceleration. Electrical interlocks are required on the contactors and the use of shunt coils also tends to make the upkeep of this kind of controller higher than that of the lockout type.

Series relay acceleration is used on direct current where speed regulation from a master controller is desired, as on cranes, hoists, etc. On alternating current, controllers of the counter emf. and lockout contactor types are used infrequently.

Vibrating Field Relays—Another application of the current limit principle is the use of vibrating field relays on direct current automatic starters, where speeds above normal are obtained by inserting resistance in the shunt field circuit.

Speed control by shunt field on practically all automatic starters can be obtained simply by adding a manual field rheostat and a vibrating relay.

(To be continued)

Spray Finishing Fundamentals

By
PAUL W. COLLINS

In this, the fifth of this series of articles on the subject of finishing electrical products, the author treats of the preparation of the surface

The best tools in the world cannot make a good mechanic. The finest of finishing materials obtainable alone cannot guarantee the desired surface appearance. Many a poor finish is unfairly attributed to the manufacturer of the coating material. While this is sometimes true, the real cause is usually found in: (1) lack of proper foundation (unclean surface); (2) improper method of application (improper drying time, insufficient sanding, etc.); (3) inadequate or improper equipment. It is a bit difficult to discuss such subjects as these and keep the reading substance of interest to all. For this reason it will be necessary to generalize briefly and reserve individual treatment for a later date or specific inquiry.

Treating the Surface—Proper cleaning is necessary before a permanent coating can be assured. Finishing an unclean article is like building a house on the shifting sands. By "clean" is meant the removal of dirt, rust, grease, oil, paint, acid, alkali and any of the other undesirable elements that may endanger the life of the coating to be applied. Even in the case of dip finishes with cheap materials and low priced products, the failure to remove the impurities from the surface to be coated frequently destroys the coating material for further use after a few submersions of unclean articles have been made.

Cast iron, steel, brass, aluminum, zinc, die castings, forgings, screw machine products; all should receive cleaning treatment according to the nature of the metal, the type of cutting aid used in machining, whether the surface is rusted, scaled or deeply pitted, the type of finishing materials to be applied, and many of the similar elements that enter into the manufacturing processes.

Where the work is small and mass production is desired such spray finishing installations as that shown above are very convenient. In this case the hood or cover over the table acts as the duct for carrying away the fumes

Castings sometimes need only a brisk scrubbing and dusting with a stiff bristle duster. This old method is fast giving way to the sand-blast machine which leaves a clean and highly desirable surface for coating. There are sand blast machines of any size and capacity ranging from one handle to very small pieces to one capable of cleaning a large casting or surface.

Small castings are frequently "tumbled" in a rotating barrel or cylinder partly filled with steel polishing balls. This process saves a great deal of labor and handling, if there are no machined threads or particular planes or corners that might become damaged in the tumbling process.

Grease and dirt are sometimes "baked out" by subjecting the metal to a heat treatment of from 400 to 700 deg. F. for about one hour. By this method the dirt and grease is forced out of the pores of the metal and crystalized on the surface. The surface is then gone over with emery cloth, steel wool or sand paper and afterward brushed off with a stiff bristle brush or an air duster.

Die castings that are to be japanned must be given a preliminary heat treatment to drive out internal gases. The heat treatment should not run higher nor lower than when the coatings are baked on. Heat treatment will cause the surface to blister with small round balls. These are to be sanded off. Zinc becomes brittle at above 170 deg. F. and aluminum becomes injured internally at above 350 deg. F. Grease and dirt should be removed from die castings by a chemical solution and dried immediately.

Rust—A patented solution is obtainable for the removal of rust. It not only eliminates this undesirable feature from the surface but at the same time impregnates the metal against further action of the same sort for quite some time. It is a combination of phosphoric acid and alcohol. The solution is simple to apply and is becoming more and more popular as a rust inhibitive coating for steel and sand-blasted surfaces. Rust is undesirable beneath a finish because it soon causes the finish to crack and chip.

Cleaning Solutions are divided into solvent cleaners (benzine, gasoline, etc.), and chemicals (alkalis, acids, etc.). All are used separately and in varying percentage combinations to clean surfaces for the finishing coat depending on the metal and the substance to be removed.

Because benzine is cheap, many think it is a very excellent cleaner to use in removing grease. It is primarily

inexpensive but soon loses its strength through dilution and quick evaporation. Many factories are giving it up in preference to chemical compounds because of the high flash point of benzine and gasoline and their consequent fire hazard.

There are a number of reliable cleaner and remover compounds marketed by reputable chemical firms who employ large staffs of chemists and men capable of diagnosing the cleaning compound best suited to the individual needs. These men analyze the metal to be cleaned, the grease and dirt found on the pieces and investigate as to the type of surface best suited to take the coating material to be applied. It is to be little wondered that these firms do an ever-increasing business.

Methods of cleaning are changing too. Not long ago, articles were put into wire baskets and plunged up and

This is a typical portable spray finishing or painting outfit that is ordinarily used for painting interiors and for regular maintenance work. The equipment is light in weight and can be transported to any part of a shop for operation

down or whirled in the boiling cleaning solution. Modern plants of today are equipped with hooded tanks through which passes an endless conveyor belt or chain. The articles when placed on the chain pass under a steady spray of cleaning solution directed at the proper angle to clean them thoroughly. From there (if necessary) they pass under a shower of clean water or neutralizer and thence through a heated enclosure for drying and on directly to the spray room or dipping tank.

Chemical solutions are usually kept at a temperature slightly under boiling. This prevents an excess of steam and helps keep the solution at its full strength as long as possible. To get the best results, the solution must be kept at uniform strength. As an accurate test cannot be made in the boiling solution, frequent samplings should be taken out, cooled and tested with an hydrometer. The reading should be close to 8 degrees Baumé, indicating an average solution of one pound of cleaner to the gallon of water.

Coating Materials—In selecting coating materials, one should consider the surface to be covered, the kind of use and abuse it will receive after having been sold, whether it is intended for use inside or out of doors, and who is going to buy the article. Then there are different quality finishes for the sliding price range of the "full line." The manufacturers of paints, varnishes and lacquers can best assist one in this respect as they can match up their materials to the particular requirements. The general basic observations for finishing any piece are, however, the primer, the surfacer, and the finish coating.

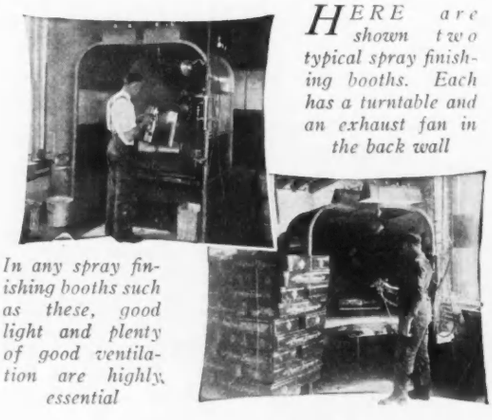
The Primer—This is applied for the main purpose of causing the finishing coats that follow to adhere to the surface. It is the "tooth" of the coating and is one of the most important steps in painting. The primer should be applied in one thin coat and must be perfectly dry before any other material is applied over it. The drying time ranges from 4 to 12 hours for oil base primers (depending on whether it is oven dried or air dried) and from 20 to 30 minutes for lacquer base primers. There are some surfaces that do not lend themselves well to a lacquer base primer and it is believed that this fact occasioned the early feeling that lacquer base primers did not have everything to be desired in a primer. The sentiment is not so strong in this respect any more, however.

Putty and Glazing Mixtures—These are next applied to a surface containing pits or depressions that should be leveled up to uniform surface. These materials are applied with a broad flexible putty knife, the action of which is to force the putty into the depressions and scrape off all surplus material. Deeply pitted castings and large depressions frequently need more than one application of surfacing with putty. Too heavy a layer cannot be applied at one time as it will take too long for the material to dry and the putty or glaze (which is a stiff putty) might crack open. Drying time for each application of putty should be approximately 12 hours. Lacquer base putties are a bit faster.

Surfacer Coats—Some finishers prefer to reserve the putty or glazing application until after one or two coats of surfacer have been put on. While it seems to be more common usage to follow the sequence offered here, there can be no possible wrong in knifing in the putty after a coat or two of surfacer has been sprayed on and sanded to smoothness. It is contended that often times slight depressions will level out with the application of the surfacer coat and it is frequently the case if the operator knows how to handle his spray gun to this end.

The surfacer coats may be applied in one or several coats, allowing proper drying time between each coat. It is true that one heavy coat is not as good as three or four light coats.

The spray gun is practically universal in the application of surfacer coats as the saving of sanding labor alone would make its use indispensable. The spray gun leaves a highly atomized surface free from brush marks and streaks, all of which would be present and have to be removed if a hand brush were used in applying the surfacer. The usual method is to apply a coat of surfacer, dry it (often hastening this process by the use of ovens), and then sand this coat down to smoothness. The subsequent coats are applied in like manner. Care must be taken that all moisture is out of the surface before the succeeding coat is applied.



HERE are shown two typical spray finishing booths. Each has a turntable and an exhaust fan in the back wall

In any spray finishing booths such as these, good light and plenty of good ventilation are highly essential

In the next instalment of this series on spray painting the applications of the different materials and spray finishing equipment will be discussed.

What's NEMA Doing?

A department covering activities of the divisions, committees and sections of the National Electrical Manufacturers Association

Bureau of Internal Revenue Reviews Depreciation Rates

The Federal Bureau of Internal Revenue is making a study of depreciation rates and has asked several industries whether they would be willing to cooperate in these studies. Representatives from the Bureau are being sent out to collect data from taxpayers for this purpose. There is no direct obligation on the part of any taxpayer to devote either time or expense in supplying such information to the Bureau's representative. Any cooperation which a taxpayer evinces is entirely voluntary.

At its Hot Springs meeting the Cost Accounting Committee of Nema appointed a subcommittee to study and review the depreciation rates as given in the manual, and submit to the chairman of the committee any recommendations concerning revision in rates in order to conform with changing conditions.

Nema suggests that since the question of depreciation rates affects the whole industry rather than any single taxpayer, it is desirable that the inconvenience of making separate studies of the plant accounts of individual members of Nema be avoided. If a representative of the Federal Bureau calls on a Nema member, it is suggested that he be referred to the chairman of the Cost Accounting Committee for any explanation of the rates which the industry has adopted and incorporated into the manual.

Circuit Breaker Group Studies Expansion of Rules

The oil circuit breaker group of the Switchgear Section of Nema, at its recent meeting in Swampscott, Mass., referred to the special committee on line-to-ground short circuits the question of amplifying and expanding the rule concerning application of oil circuit breakers on line to ground and line to line short circuits. The rule submitted by the committee covering application for interrupting capacity has been given preliminary approval, subject to final approval by mail vote.

New Armored Cable Standard Is Announced

A recent meeting of the Armored Cable & Metallic Flexible Conduit Section, Nema, with representatives of the Underwriters' Laboratories, produced a unanimous agreement relative to a new tentative standard for armored cables and cords. The provisions of this standard will be applied to all new products submitted for labeling after Oct. 1.

More than three years ago the industry requested the Underwriters' Laboratories to undertake research to determine the adequacy of armored cable for the service for which it is recognized by the National Electrical Code. A detailed report of the research, including various recommendations, has been under consideration for some months. The recent action indorsing a new standard will make these recommendations effective.

One major improvement will be a control of the resistance of the armor to values consistent with proper fusing for the conductors involved. In this way overheating will be avoided, unless currents not appropriate for the material are imposed upon the armor.

Changes in voltage tests, minimum requirements for weight, dimensions and convolutions are likewise recorded in the new standard, as is also a statement of the principles of fibrous inclosing coverings for the conductor assemblies.

Materials labeled in good faith under existing procedures prior to Oct. 1 should be considered standard, as should materials satisfying the new text found installed at a prior date.

C. L. Collens Is Appointed to A.S.A. Board

Clarence L. Collens, vice-president in charge of the Policies Division of Nema has been appointed to the board of directors of the American Standards Association. He was designated to that position by Nema, which is a member body of the A.S.A.

In announcing the appointment of the first board of directors of the A.S.A., the advisory committee stated that this is the first step in the reorganization of the former American Engineering Standards Association.

Papers Are Sought for World Power Conference in June

The Second Plenary Meeting of the World Power Conference, organized by the German committee, will be held in Berlin during the early part of June, 1930. A wide variety of subjects dealing with power will be discussed. In the field of electricity the following general subjects for discussion have been announced: generation of electricity; distribution of electricity; application of electricity to industry; application of electricity to electric railways; application of electricity in the house and on the farm.

The Berlin committee insists that all papers stress the economic features of the subjects indicated, including technical details only so far as they may be necessary to the main object of discussion.

Nema has appointed C. E. Skinner, Westinghouse Electric and Manufacturing Company, as chairman of a committee to receive papers and arrange for their inclusion in the Berlin program. The papers should not exceed 7500 words in length, should be written in either English, German or French and should be accompanied by a summary not exceeding 500 words, in either of the two languages other than that in which the paper has been prepared. It is recommended that the author attach to his paper a separate table of contents. Detailed instructions by those intending to contribute may be obtained from Mr. Skinner.

Papers must be in the hands of the committee before Nov. 1 if they are to be accepted for the Berlin program.

New Voltages Are Recommended for March 1, 1930

The special committee on applications under the new system voltages, recommended that manufacturers list oil circuit breakers with the new voltage ratings on March 1, 1930, for sale on and after that date. The secretary was instructed to inform members of this action, and that it is the expectation of manufacturers to continue quoting on the next higher voltage rating until that date.

Transformer Section Enlarges Field Test Committee

The Transformer Section has enlarged the committee on field tests on transforming by adding the names of R. O. Sagge and L. C. Nichols to the committee.

The Transformer Section has submitted to letter ballot the question of collecting statistics through Nema headquarters.

The committee on obsolescence of transformers is collecting data which will show comparative losses of distribution transformers over a period covering the last thirty years.

Nema Fall Meeting

As this issue of ELECTRICAL MANUFACTURING goes to press, more than 300 members of Nema are about to go into session for the annual meeting, Oct. 7-12, at the Wardman Park Hotel, Washington, D. C. Election of the board of governors, addresses by prominent speakers and several trade practice conferences are to be the features of the meeting. A complete report of all elections, results of trade practice conferences and interesting sidelights will appear in the November issue of ELECTRICAL MANUFACTURING.

Characteristics That Determine the *Selection* of MOTORS

No. 17 of a Series Discussing Motors of Different Types

Elevator, crane, hoist and electric railway applications form a large part of the use of direct current motors of different types

BY THEODORE SCHOU
Consulting Engineer
Fairbanks, Morse & Co.

AND

C. P. ROBINSON
Synchronous Engineer
Ideal Electric & Mfg. Co.

THE direct current motor still holds the commanding position as regards number of applications in certain fields. Elevators of certain types, cranes and hoists and electric railway service are a few of the most important examples of these fields. Of particular significance is the gearless elevator motor and its applications, as explained in the following.

Series Parallel Operation of D. C. Motors—Often conditions arise where the use of two motors in parallel fulfills several purposes.

1—Emergency operation with a single motor.

2—Preferable on account of size and the interchangeability of parts.

3—Permits stocking of standard motors of the same size for several applications. Of course, to have each motor

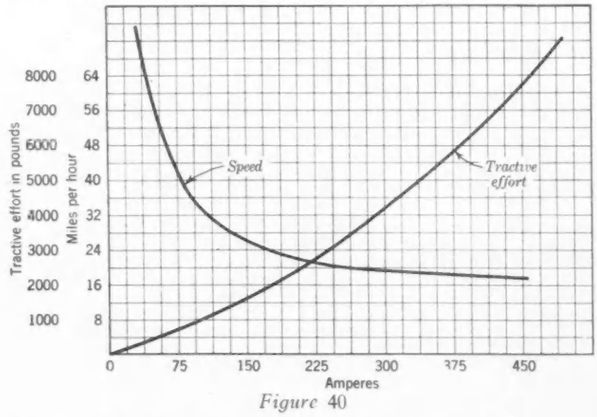


Figure 40

Characteristics of speed and tractive effort for a typical railway series wound motor. These curves show that the motor develops the greatest tractive effort at the lowest speed, which is the characteristic that makes it desirable for this work

large enough to handle the total load means a larger investment though in some cases this may be justified. Generally, however, it is sufficient to have both motors together able to carry the load with some extra margin and one motor alone able to carry the load at some overload and reduced speed.

Applications of this sort have been made on hoists on ladle cranes or tilting motion of metal mixers, places where a loss of power apparatus would mean a loss of product before repairs could be accomplished.

Another application of similar nature is that of a traveling crane of large size, where two motors drive the two end trucks, coupled mechanically through the shaft between the trucks. The same method is applied on ore bridges where the two ends of the traveling bridge operate in parallel without mechanical connection other than through the track and wheels.

The operation of motors in series has some advantages in common with the parallel connection, and also other advantages.

The control for two motors in series is less expensive, since it is equivalent to the control for one motor alone, or nearly so. Two motors in series develop starting torque equal to that of two motors connected in parallel, but with less total current input, as the same current passes through both motors.

Motors are sometimes arranged through the control to operate in a combination series and parallel arrangement.

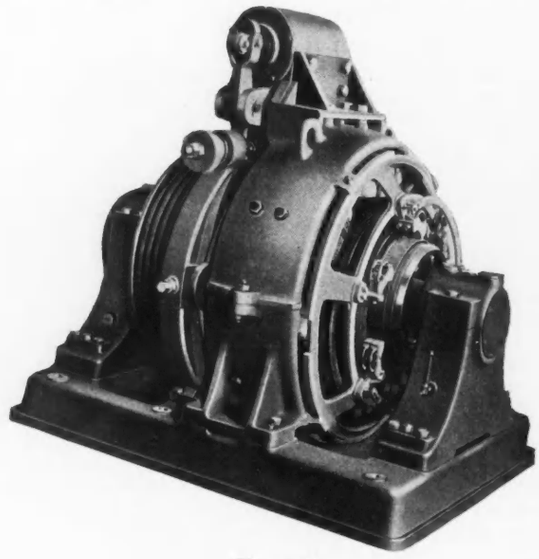


Figure 41

A typical gearless elevator motor of the type commonly built several years ago. This view is from the commutator end. In comparison with some of the other illustrations, this view shows the changes in type of construction in a relatively short time

Electric railway motors are perhaps the most common example of this use. Here the motors are brought up to half speed while connected in series; then if a higher speed is desired, the motors are connected in parallel. The arrangement is simple and economical as it reduces acceleration losses.

Motors operating in series should be connected rigidly by mechanical means, otherwise, the motors may not properly share the load.

Motors connected in parallel require similar characteristics. In general, shunt wound motors do not operate readily in parallel, compound wound motors are usually quite good.

Electric Railway Motors—The series wound D. C. motor has long been used in this field of application with good success. Its use in this connection is so commonly realized that it is mentioned here simply to make the discussion on motor characteristics more complete.

Figure 40 shows the characteristics of speed and tractive effort for a typical railway series wound motor. These curves show that the motor develops the greatest tractive effort at the slowest speeds that exactly fulfill this requirement for this particular type of service.

Elevator Applications—The field of elevator motor service is probably one of the largest and most important fields for the D. C. shunt wound motor. Reference was made in preceding articles to the fact that the D. C. elevator installation provided the utmost in smoothness of acceleration and simple control. This reference was made in connection with the discussion of various types of alternating current motors for elevator service.

In large office buildings of many stories, elevator installations are required to handle a tremendous peak load of office workers and business men during certain hours of the day, between or before and after working hours, as well as to handle a normal load during working hours. For such installations a service is required that can provide the maximum in speed and acceleration for the peak loads, and yet at the same time, operate without discomfort to the passengers.

The gearless direct current motor with variable voltage control meets these requirements, at the present stage of electrical development, better than any other type of motor.

As was mentioned before in connection with the discussion of alternating current elevator motors, the cost of the gearless elevator motor installation, with its accompanying motor generator set, separate exciter, control panels, and other auxiliary equipment is considerably in excess of the cost of an alternating current elevator motor installation. However,

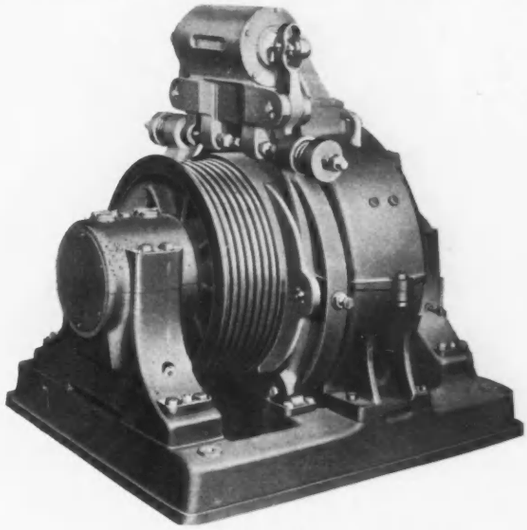


Figure 42

A view from the sheave end of the same motor as that illustrated in Figure 41. It will be noticed that this type of motor was constructed with a cast base and heavy sturdy sleeve bearing. This construction was very satisfactory, and there are a large number of these motors in operation at the present time

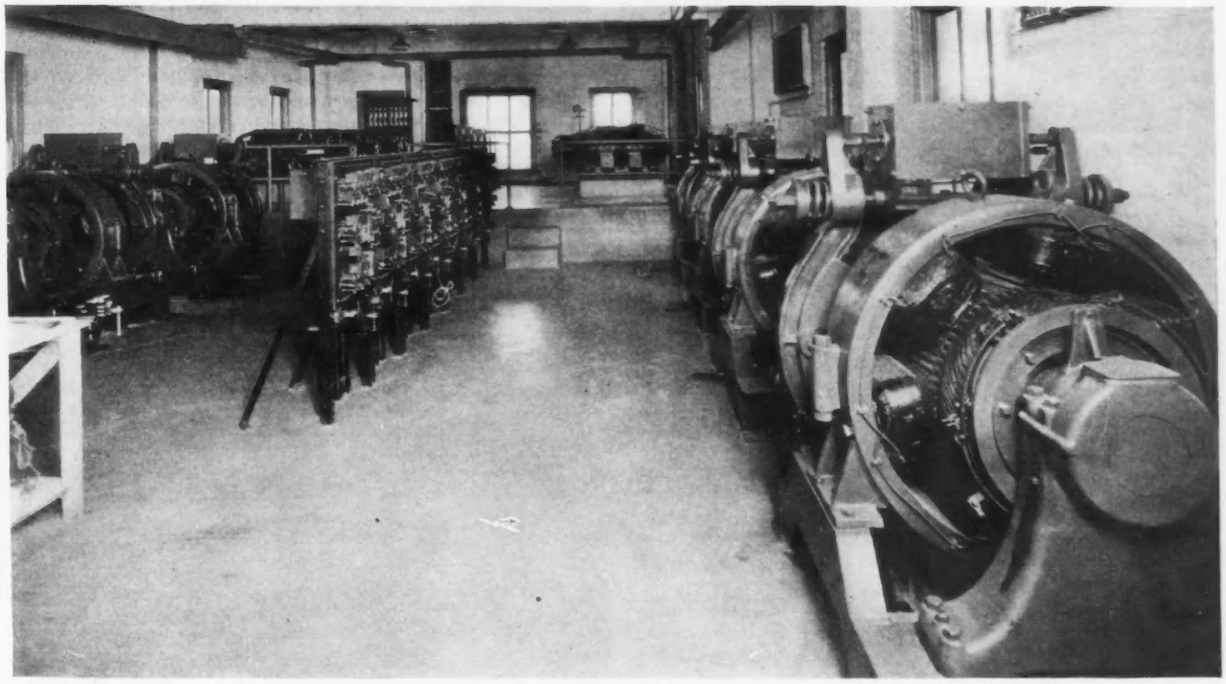


Figure 43

This illustration shows a typical penthouse with a battery of gearless elevator motors and the control equipment necessary for them. In the background will be noticed the accompanying battery of motor-generator sets. The set mounted directly back of the center aisle on the raised platform shows particularly well the separate exciter mounted on one end of the shaft of the set

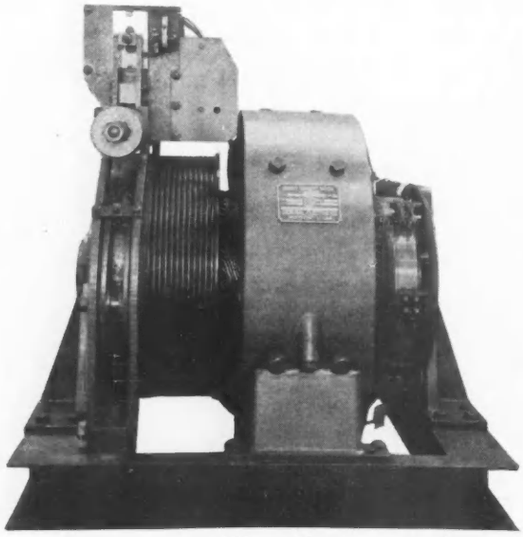


Figure 44

The compactness of the modern gearless elevator motor is attained through the use of rolled and welded steel construction. The same strength is maintained throughout and the bearings may be ball or roller, set in a welded steel pedestal

the advantages gained by using the gearless elevator motor, particularly in large installations usually offsets this first investment. In large office buildings, quick and convenient access must be available to every floor. The elevator in-

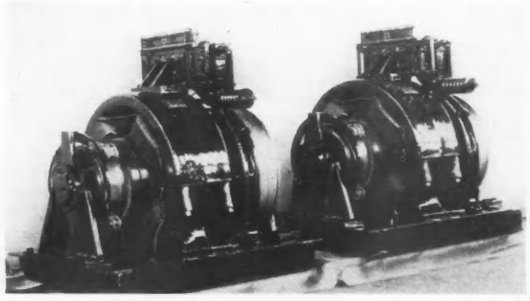


Figure 45

This illustration shows two motors of the type shown in Figure 44. *These motors are for* 2 *to* 1 *roping. For a given application the motor with* 2 *to* 1 *roping runs twice as fast as one with* 1 *to* 1 *roping with the corresponding decrease in size and cost*

stallation, while a large item, does not bear a very large ratio to the total building costs.

One of the developments that has kept pace with the ever increasing height of office and apartment buildings, is the gearless elevator motor installation, with its constantly increasing ranges of speed, refinements of control, and improved mechanical construction. The development of alternating current elevator motors has been along the same lines as discussed in previous articles. However, the A. C. motor application has inherent features that will not permit, at present, the same flexibility and smoothness as can be attained with the gearless direct current motor.

The gearless elevator motor consists of the motor, cable sheave, brake drum, and solenoid operated brake, designed and built as a unit, usually with two pedestal bearings and a base. The unit is mounted in the penthouse at the top of the building, directly over the elevator shaft. The cables that raise and lower the elevator cage, pass directly over the cable sheave that is part of the motor unit. The motor bearings, then, must take a very large part of direct thrust from the elevator load, depending upon the total load and method of cable wrapping. It is essential that the motor be of sturdy construction. In addition, the electrically operated solenoid brake, brake drum, and brake shoes, must be properly designed mechanically to have a large margin of safety over normal requirements. Ordinarily the function of the brake is only to stop the motor and its load, after the motor has reached the lowest speed the control provides, and then to hold the load. An emergency may require the brakes to stop the maximum load the elevator can carry while descending. This factor enters into the design of this portion of the gearless motor unit.

Welded Steel Construction in Gearless Motors

DEVELOPMENTS have been fairly rapid in this field during the last few years.

Figure 41 shows a typical gearless elevator motor such as was built a few years ago. This view is from the commutator end.

Figure 42 shows the same motor viewed from the sheave end.

These illustrations are shown in connection with this article to indicate the changes that have taken place in type of construction within a relatively short time. It will be noticed that this type of motor was constructed with a cast base and heavy sturdy sleeve bearings. This construction was very satisfactory and there are a large number of such units in operation at the present time.

Figure 43 shows a typical penthouse with a battery of gearless elevator motors, with the necessary control equipment. In the background will be noticed the accompanying battery of motor generator sets; the set mounted directly back of the center aisle on the raised platform showing particularly well the separate exciter mounted on one end. The separate exciter is an essential part of the variable voltage control as will be explained later.

Figure 44 shows that the modern compactness of the gearless elevator motor is attained through the use of rolled steel and welded steel construction. The same or greater strength is maintained by the use of steel throughout. The bearings may be either ball or roller bearings, set in a welded steel pedestal. This type of construction has come into general use recently. The use of steel has lightened the motor and made it much more compact without sacrificing sturdiness. This illustration supplies an excellent example of the trend in mechanical design in the motor field.

Figure 45 shows a group of similar motors ready for shipment. These motors were built for 2 to 1 roping. For a given application, a motor built for 2 to 1 roping runs at twice the speed of a motor providing for 1 to 1 roping, with a corresponding decrease in motor size, and a reduction in the initial motor cost.

Figure 46 shows a typical motor generator set for use in connection with control of the elevator motor.

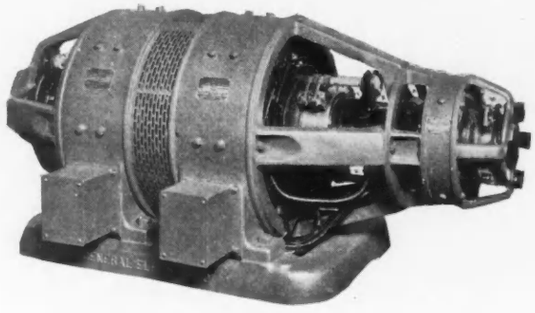


Figure 46

A typical motor generator set of compact construction for use in connection with the control of elevator motors

Chromium—Its Uses in the Electrical Industry

No. 19 of a Series of Articles on Common Materials

Chromium plating is not at all new in industry but it is only within recent years that the process has been generally adopted by manufacturers

By William Crawford Hirsch

CHROMIUM-PLATING as a commercially practical process appeared on the industrial scene at the psychological moment when the American manufacturer began to realize the importance of breaking down sales-resistance by endowing his product with an attractive appearance. As so often happens when an industrial need makes itself felt, the wish for a coating for metal surfaces that would be ornamental as well as protective synchronized with its fulfilment through the development of chromium-plating from the laboratory stage to that of economical mass production.

Bunsen, inventor of a battery cell named for him, is generally credited with having been the first to accomplish the electrodeposition of chromium. That was about 75 years ago. Until a few years ago, chromium-plating remained what it was in Bunsen's day—a laboratory feat that could not be translated into commercial usefulness. Today, thanks to intensive research by prominent electrochemists and the practical organization of the process by patentees, chromium-plating has attained a distinct field of industrial usefulness, not merely as a decorative finishing process, but in numerous applications as a means of imparting greater wear-resistance to working metal parts.

Such electrical appliances as percolator sets like that shown above lend themselves very well to chromium plating. They take a beautiful finish and are virtually free from discoloration

Chromium occurs in nature only in combination with other elements, chromite being the only important mineral from which chromium is derived. Like in the electrodeposition of metals generally, very slight quantities of chromium suffice for the covering of extensive surface areas, so that the growth of chromium-plating will never be adequately reflected in statistics of chromite consumption. By way of background, however, the sources of supply for the raw material from which chromium is derived may be briefly summarized. Rhodesia and New Caledonia yield most of the higher-grade chromite, American capital having an interest in the deposits of France's colony in the South Pacific. While theoretically the United States has chromite ore reserves exceeding 1,250,000 tons, chiefly in California and Oregon, domestic production came to an abrupt halt with the end of the European War, none of the deposits being high-grade and profitable operation in normal times being apparently out of the question.

There has been marked diminution within recent years of high-grade chromite ores, and ores with a chromic oxide content of 46 to 47 per cent are considered satisfactory today by buyers who formerly would insist upon a 50 per cent minimum content. The heaviest consumption of chromite is in the manufacture of ferrochrome in which alloy form chromium is introduced into steel as a hardener and as a means of making steel "rustless" or "stainless." Refractories, especially super-refractories used for the lining of electric furnaces, account for the next largest consumption of chromite, followed by that which enters into the manufacturer of a wide range of chemicals, pigments and dyestuffs.

Separation of the metal from the other constitutents of the chromite, yields brittle, glistening scales of grayish tin-white color. The fused metal is noted for its hardness. Electrical manufacturers know chromium best from its use as an alloy with nickel in the manufacture of heating elements and resistance wire.

Very early in the commercial career of chromium-plating, the metal's relatively high reflectivity was recognized by reflector manufacturers. In this property chromium is exceeded only by silver. Whereas the latter has a tendency to tarnish easily and chromium retains its mirror-like brilliance. This, together with the wear-resistance which the hardness of chromium-plate provides, first attracted the attention of the electrical industry to the advantages of this finishing process. Since then chromium-plating has come into vogue for, one might say, two distinctive purposes. Where it is desired to profit to the full from chromium's extreme hardness, low co-efficient of friction, and resistance

to corrosion, a relatively heavy coat is deposited. This is the case when it is sought to minimize the effect of rubbing wear in working parts, such as in fan-blades, etc., or to lengthen the useful life of moulds, dies, tools, etc. Where decorative effect is the principal objective, chromium is plated in a thin coating over nickel-plate or directly over copper, nickel-silver and kindred alloys.

Whereas in the earlier stage of the commercial development of chromium-plating it was frequently stated that the process doesn't differ materially from the electrodeposition of other metals, the danger of such an analogy is now pointed out by those who speak from actual experience. The high current density necessary is only one factor which sunders chromium-plating from the general run of electroplating. Changes in the bath or anode during electrolysis are not visible to the operative, but call for chemical control. Temperature and amperage of the bath must be more closely watched than in plating with other metals. In brief, authorities are agreed that chromium-plating requires not merely somewhat different equipment to overcome the action of the chromic acid, but that technical supervision or tutelage of a higher order is essential to success.

The chromium-plating bath consists of chromic acid and other chemicals, working formula and solutions forming part of important patents under which licenses to users are issued. This holds true also of the anodes. It may be stated, however, that in the development of chromium-plating, iron has been tried out as anode material by the side of chromium and lead. When chromium is electrodeposited upon an electrolytic coating of nickel or some other metal, the result is the same as if the cathode consisted entirely of that metal, the surface and not the composition of the metal body influencing the chromium plate.

Forethought on the part of the electrical designer and consultation with chromium-plating specialists while the design of an electrical appliance or apparatus can still be modified without entailing costly changes in dies, etc., will go far toward overcoming the limited throwing power of chromium-plating solutions which makes the use of the process for ware with highly irregular surfaces unnecessarily expensive. When it is intended to chromium-plate an article, it should be designed with that finish in mind. In many cases, irregularity of surface is predicated on nothing more than the striving after an out-of-the-ordinary effect. With chromium-plate supplying all the ornamentation needed, recesses and reliefs, when their intent is merely decorative, can be dispensed with.

Constant progress, however, is being made in broadening the chromium-plating process and pieces are being plated today which in the earlier stages of development were thought to be without the range of the process. Arrangement of the ware to be plated, the racks, and anodes, so as to obtain the greatest possible uniformity of the current density over the cathode surface, has been brought up to a fine art, and here again the specialist in chromium-plating has developed a technique that attains very frequently satisfactory results with difficult shapes of which the general plated would make a sorry botch job.

In mass production, efficient types of conveying plating machines have been developed. These lift the work from one tank into the next by means of automatic guides, preparatory cleaning and rinsing being accomplished in the first tanks, that with the plating bath coming next and this in turn followed by a water rinse tank. Most thorough cleaning, whether carried out in automatic type plating machines or otherwise, is of the greatest importance prior to chromium-plating, the formation of unwelcome chromic salt in the initial stages of electrodesposition being avoided when the "work" is clean before it enters the plating bath.

In the earlier days of chromium-plating, technical investigators laid some stress on the relatively high power consumption entailed in the process. It is quite true that power consumption in chromium-plating is high in comparison with that required for the electrodeposition of other metals, but commercially, especially in mass production, power consumption is after all only a minor cost factor. Chromium-plating, by way of decorative finish or protective coating or both, adds, of course, something to the cost of a product, but in addition to enhancing saleability and serviceability there are offsetting economies as a good deal of extra buffing and polishing and, in some cases, non-metallic finishes over plate can be dispensed with.

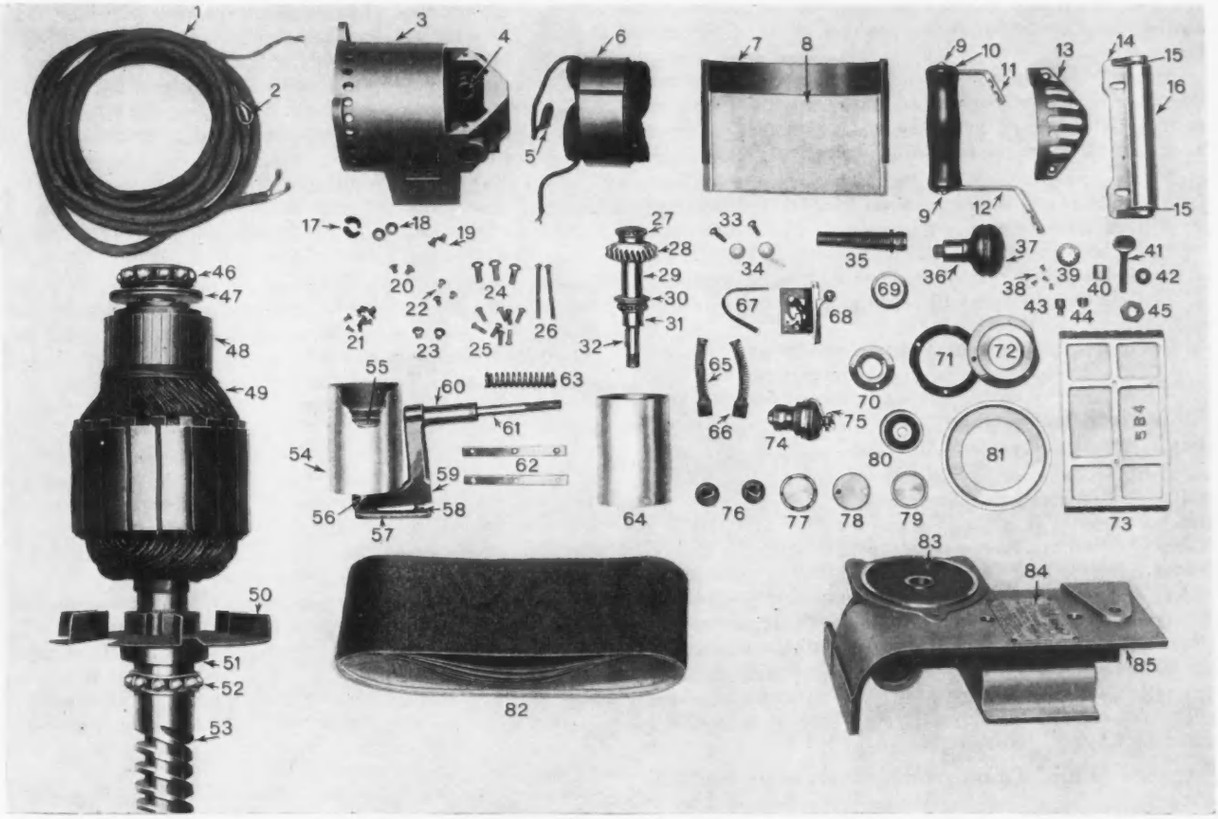
The electrical manufacturer's interest in chromium-plating, as has been previously intimated, is two fold: as a finish for his product and as a preservative for his dies and moulds. Chromium-plating prolongs the life of moulds used in the forming of insulating parts from phenol-formaldehyde resins and kindred compounds. In the die-casting of parts for domestic, industrial and office appliances, chromium-plating adds to the resistance of dies to abrasion under strenuous use. Manufacturers of illuminating glassware can considerably lengthen the life-span of their pressing moulds by chromium-plating them. The same holds true of dies for wire-drawing. An interesting phase of the utilization of chromium-plating is in the reclaiming of undersize parts that call for high precision in dimensions. Limits in chromium-plating can be held to very narrow tolerances, to within 0.0001-in. Chromium-plating, therefore, can be regulated to bring undersize parts up to the right thickness or diameter.

Here is another electrical product that is now being finished by chromium plating. Heat has very little effect upon such a finish, and the appliance may be highly polished

According to recent press reports, an efficient process has been developed for the chromium-plating of aluminum along commercially practicable lines. If these reports prove correct, a still greater field of utilization in electrical manufacturing awaits the electrodeposition of chromium because in many applications aluminum's light weight plus chromium's resistance to tarnish will prove an ideal combination.

Although barely more than five years old, commercial chromium-plating has forged steadily ahead with the result that there are today several hundred specialty establishments aside from manufacturing plants whose volume is such that they can profitably operate their own chromium-plating departments. It depends altogether upon the quantity requirements whether operation of a chromium-plating department by the electrical manufacturer or the giving out of the work to a chromium-plating specialist is the more advantageous. Owners of chromium-plating process patents license both jobbing and consuming plants and furnish the necessary technical supervision.

Portable Electric Sander Parts



ELECTRICAL MANUFACTURING *acknowledges the assistance of the Porter-Cable Machine Company, Syracuse, N. Y., in the preparation of the illustration shown above and the following table of portable electric sander parts. This is typical of many types of portable sanders being manufactured today and will serve to show the large number of parts involved*

Table of Parts and Raw Materials Used in Portable Electric Sander Construction

Part No.	Description	Material
1	Portable cord	Copper
2	Connector	Copper
3	Frame	Aluminum
4	Brush holder	Copper
5	Connector	Copper
6	Stator	Copper
7	Shoe	Steel
8	Shoe pad	Felt
9	Pin	Steel
10	Handle	Wood
11	Handle bracket	Steel
12	Handle bracket	Steel
13	Guard	Aluminum
14	Roller bracket	Aluminum
15	Roller pin	Steel
16	Roller	Aluminum
17	Insulator	Fibre
18	Washer	Steel
19	Screw	Brass
20	Screw	Brass
21	Screw	Steel
22	Screw	Steel
23	Screw	Steel
24	Screw	Steel
25	Screw	Steel
26	Screw	Steel
27	Bearing	Steel
28	Gear	Bronze
29	Shaft	Steel
30	Collar	Steel
31	Spacer	Steel
32	Key	Steel
33	Screw	Brass
34	Washer	Steel
35	Guard	Steel
36	Knob screw	Steel
37	Knob	Wood
38	Screw	Steel
39	Lock washer	Steel
40	Spacer	Steel
41	Screw	Steel
42	Washer	Steel
43	Plug	Steel

Part No.	Description	Material
44	Plug	Steel
45	Nut	Steel
46	Bearing	Steel
47	Collar	Steel
48	Commutator	Copper
49	Rotor winding	Copper
50	Fan	Steel
51	Spacer	Steel
52	Bearing	Steel
53	Gear	Steel
54	Roller	Aluminum
55	Shaft	Steel
56	Pin	Steel
57	Bracket	Aluminum
58	Spring	Steel
59	Bracket	Steel
60	Shaft	Steel
61	Shaft	Steel
62	Clamp	Steel
63	Spring	Steel
64	Roller	Aluminum
65	Brush spring	Brass
66	Brush	Carbon
67	Spring	Steel
68	Switch	Copper
69	Washer	Steel
70	Washer	Aluminum
71	Washer	Fibre
72	Collar	Aluminum
73	Shoe	Aluminum
74	Plug	Copper
75	Guard	Brass
76	Plug	Rubber
77	Collar	Steel
78	Collar	Steel
79	Collar	Steel
80	Collar	Steel
81	Retainer	Aluminum
82	Abrasive	Sandpaper
83	Housing	Aluminum
84	Name plate	Brass
85	Bracket	Aluminum

Antifriction Bearings

(*Continued from page* 50)

conditions is materially less than for solid or semi-fluid friction and represents the minimum obtainable for plain bearing operation with entire absence of wear of journal and bearing.

In order to produce fluid friction it is necessary to maintain the journal in floating position through a supply of a sufficient quantity of lubricant under pressure. This can be accomplished in the following manner:

(1) By means of special pumps forcing the oil into the clearance space between journal and bearing. This is done in connection with thrust bearings.
(2) By means of continually changing the direction of the bearing load thereby inducing a pumping action which keeps the clearance space filled with oil.
(3) By means of pumping action of the journal surfaces proper due to lubricant viscosity and the formation of a wedge shaped lubricant film between journal and bearing.

Fluid friction increases with increasing viscosity of the lubricant, with increasing velocity of the rubbing surfaces and with decreasing pressure upon the projected bearing area. Viscosity of a fluid is the measure of its internal friction. Viscosity is measured by observing the time required for a certain volume of the liquid or fluid to flow under definite conditions of pressure and temperature through a given short tube with a small diameter. The viscosity of lubricating oils decreases with increasing bearing temperatures and varies considerably for different lubricants.

The viscosities of different fluids compared with that of water of 68 deg. Fahr. are shown in the following table:

Fluid Comparative Viscosity

Water	1
Watervapor	1/200
Air	1/100
Kerosene	1.5
Mineral Oil	150-300
Spindle Oil	10-20
Olive Oil	50-100
Castor Oil	550

The conditions under which a lubricant film is formed through the pumping action of the journal surfaces proper are formulated by the hydro-dynamic theory of bearing lubrication. This theory was originally formulated by Professor Osborne Reynolds in 1886. It has received certain modifications based upon the experimentations of Kingsbury, Tower, Goodman, Lasche and others, and the latest revision of the theory has been by Guembel. In order to obtain perfect lubrication or, in other words, fluid friction, it is necessary according to the hydro-dynamic theory of bearing lubrication, that the film between the sliding bearing surfaces be wedge shaped. (See Figure 1).

In Figure 1 R represents the resultant force exerted by the journal upon the oil film, the arrow indicates the direction of journal rotation; the eccentricity is the distance between the centers of journal and bearing. The action of journal during its rotation due to the adhesion of the lubricant and the journal pressure is to draw oil from the region of least pressure and to carry it within the region of greater pressure. In other words, the lubricant travels from the blunt to the thin edge of the wedge. The lubricant pressure created through this pumping action causes the journal to be lifted from the bearing when a certain speed has been reached, provided there is a sufficient volume of oil available and the clearance between journal and bearing prevents metallic contact.

Figure 2 shows the pressure variation in the oil film of a journal bearing for different bearing pressures and for two different methods of oil circulation. The factors which determine the possibility of maintaining the lubricant film between journal and bearing are the following:

(1) The intensity of pressure on the oil film.
(2) The sliding velocity of the bearing surfaces.
(3) The characteristics of the load at high speed.
(4) The method employed for introducing, distributing, carrying away and cooling the lubricant.
(5) The characteristics of the bearing surfaces, i.e., their finish (whether new or run in) and the arrangement of the oil grooves.
(6) The clearance between the journal and the bearing.
(7) The viscosity of the lubricant under the prevailing operating conditions of the bearing (temperature).

The intensity of the pressure on the oil film depends upon the pressure upon the projected bearing area of the bearing, the point or points of application of the load on the journal relative to the bearing, the stiffness of the bearing support as well as of the journal, the rubbing velocity, the viscosity of the lubricant and the clearance between journal and bearing.

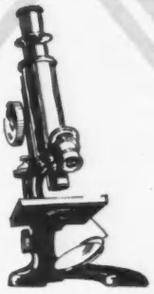
Owing to oil leakage at both ends of the bearing, caused by the necessary clearance between journal and bearing, the pressure intensity on the oil film decreases from a maximum at the center to zero at the ends. In Figure 2 the film pressures at the center and a position midway between center and end of a bearing are shown.

Figure 3 shows the reduction in oil film pressure toward the bearing ends according to different authorities. It will be readily seen from this diagram that the carrying capacity of a journal bearing is only a part of what it would be if it were possible to keep the ends closed so as to maintain the same oil film pressures along the entire length of the bearing. The sliding velocity of the bearing is of importance for the maintenance of the oil film since there is insufficient pumping action below certain speeds to provide the oil pressure necessary to build up the film.

The load characteristics at high speed are of decided influence upon the maintenance of the oil film. As long as a journal operates inside the first critical speed range of the rotor there is no danger of film rupture (provided the speed is sufficiently high to form the film). When passing through the critical speed range, however, the shaft begins to vibrate and distort which, owing to the necessary limitation of the clearance between journal and bearing, will cause local contact between sliding surfaces. This reduces rupture of the oil film and consequent introduction of boundary friction with resultant temperature rise. This in turn reduces the viscosity of the lubricant and therefore the resistance of the film against rupture. To prevent this metallic contact with increased friction and necessary wear it is imperative to equip high speed bearings operating at speeds above the first critical with circulating lubricant pressure feed which also provides a means to carry away the heat generated in the bearing. The methods of introducing and distributing the oil have a decided influence upon the maintenance of the desired oil film.

Figure 2 shows the very considerable drop in oil film pressure for two different schemes of circulating the oil in a journal bearing. The closed bearing with oil inlet and outlet at the same point of lowest pressure produces film pressures practically twice as high as for a bearing with oil inlet and outlet at opposite sides of the bearing. The cooling of the bearing or the lubricant is likewise of importance because of its effect upon the viscosity of the lubricant.

The condition of the bearing and journal surfaces are bound to influence the formation and maintenance of the oil film, although the materials of journal and bearing as such have no influence whatever upon the film or the



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fluid friction in the film. New bearing surfaces, improperly scraped or burnished are bound to cause metallic point or surface contacts which rupture the film, and this condition will persist until the surfaces are run in, that is, the inequalities worn off. Circulating pressure lubricating systems will assist in carrying away the worn metal particles, which should of course be prevented from being returned to the bearing by means of suitable strainers. Oil grooves improperly located, i.e., away from the zones of minimum film pressure will cause a drop in oil film pressure with consequent rupture of the film.

In Figure 4 the dotted line shows the oil film pressures along an open journal bearing without oil groove, while the full lines indicate the oil film pressures with an oil groove at the point near the maximum oil film pressure. The clearance between journal and bearing is of decided influence upon the maintenance of the oil film. The relative displacement of bearing and journal centers increases with increasing speed and decreasing viscosity and decreases with increasing load. With insufficient clearance the journal rising upon the oil film will begin to touch the bearing at the opposite side with resultant boundary lubrication and wear. This necessitates proper safeguards against shaft deflection and misalignment of the bearings in excess of the clearance spaces available for the journal within the bearing. Self-aligning bearing seats will be found of advantage in this connection.

Lubricants having low viscosity, in other words those which flow readily, produce lower fluid friction in the bearing, but they require, on the other hand, a higher surface velocity to form the required wedge shaped film. Lubricants of low viscosity are therefore desirable at high surface speeds provided the semi-fluid frictional condition during the starting period is safeguarded by the employment of pressure feed oil circulation or the selection of suitable journal and bearing materials.

It is therefore quite feasible to use water as lubricant under service conditions where oil lubrication would present considerable practical difficulties. It is only necessary to protect the shaft against corrosion and to employ bearing materials of satisfactory solid or semi-solid frictional characteristics. Hardwood with and without graphite or oil impregnation, metallic bearings with graphite inserts, rubber, etc., are satisfactorily used in conjunction with water as lubricant.

In this connection it is interesting to note that even air can be made to form a wedge shaped film in bearings, which has been experimentally demonstrated by Professor Kingsbury. Having described the characteristics of the different types of friction existing in plain bearings, the author will proceed in his next article to deal with the description of the various plain bearing types available to the designer of electrical machinery.

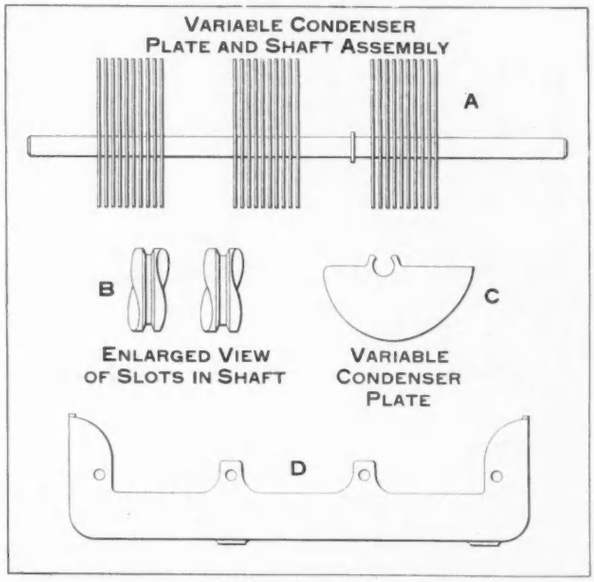
Radio Production

(*Continued from page* 31)

position with the terminals making connection with spring contacts. Each complete assembly, the completed chassis and socket power unit is now ready for assembly into the cabinet. These cabinets are inspected at various points along inspection benches to the packers, and upon being received from the manufacturer, before the assembly is inserted.

The cabinets are placed on a gravity roller conveyor leading to the final cabinet assembly, in which the leads from the chassis cable are attached to the terminal board of the supply power unit in their respective positions. They are then placed in the cabinet, the screws tightened, escutcheon and name plates applied, and the switch and volume control plates are assembled in their proper location.

The complete receiver is then given a rigid final test, being checked for sensitivity, and the voltages of the socket power unit terminals are checked.



Some method of identification is obviously necessary in order to keep the various test and inspection operations in sequence and avoid confusion with rejected units at the various inspection and test stages on the assembly floor. This is accomplished by means of a three stub tag, which is placed on the units by the first assembly inspectors. This tag lists the routine inspection and test operations performed on each unit, and each inspector or tester, after completing his or her work, initials the corresponding operation listed on the tag, provided the unit is passed. A serial number of the chassis, and this tag accompanies the unit through all operations. It is a function of the final inspector to see that all inspection and test operations have been properly signed for, after which he initials and removes the first stub, which is filed by serial number for future reference. The second stub is removed by the packer. The third stub is placed on the outside of the shipping container by the packer, and is removed and filed according to shipments and destination, at the time the receivers are loaded in cars for shipment. By this system, a definite record is maintained by serial number, of the inspectors and testers, and any complaints that may be made by serial number can be brought to the attention of the responsible parties.

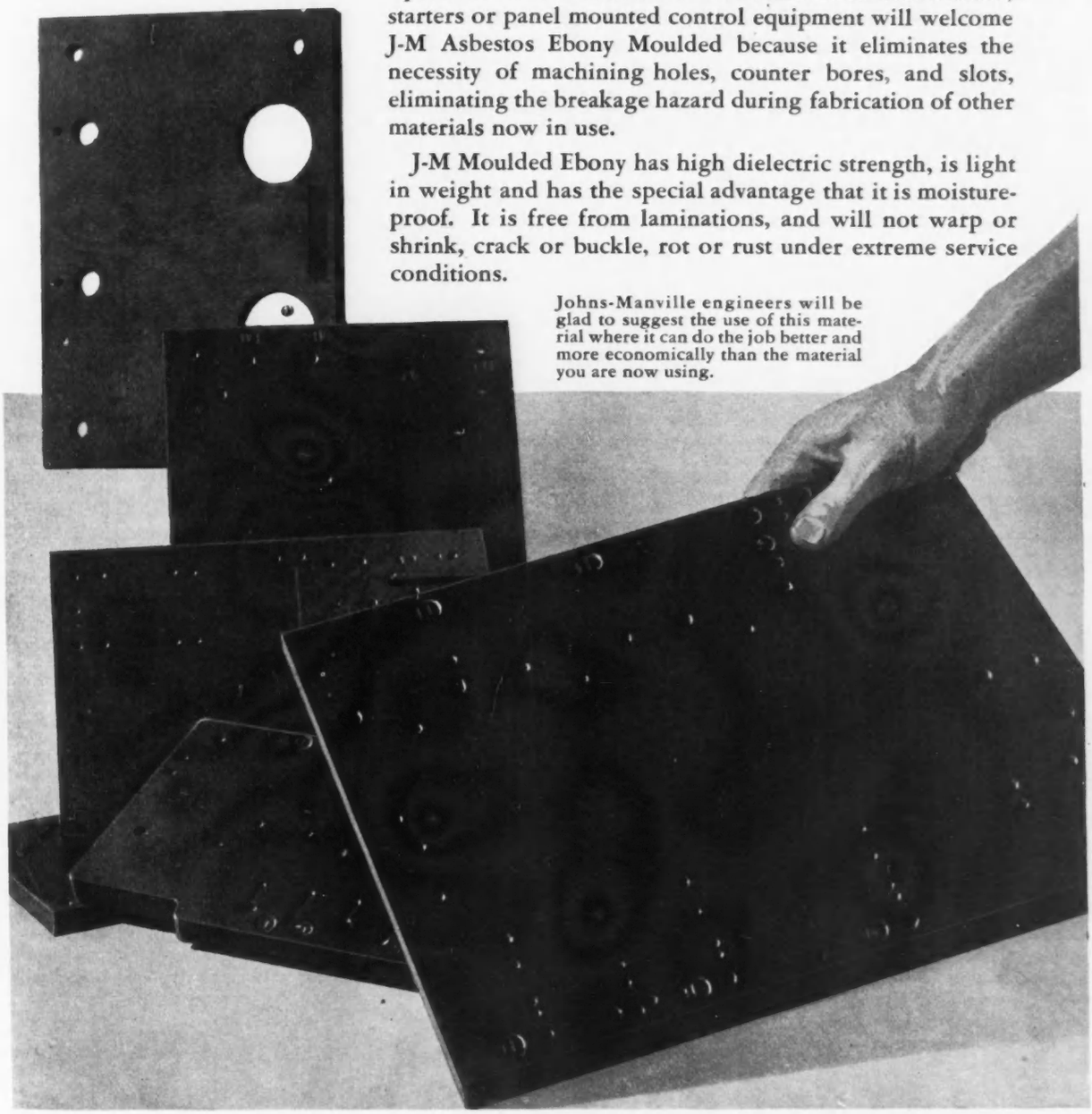
Still further precautions are taken to prevent occasional errors creeping into production and getting into the hands of distributors and dealers before they are detected. A proving room, located several miles from the factory, provides facilities for collecting engineering data, as well as giving the apparatus an actual performance test. A percentage of each day's production, selected at random, completely packed for shipment, is moved to the proving room where it is removed from the shipping container and carefully checked for errors in packing. The receiver is given an inspection and then tested for performance and operation on an engineering test basis. The receiver is also tested on actual broadcast reception, duplicating as nearly as possible the conditions which the ordinary purchaser would encounter and experience upon the installation of the receiver in his home. If the percentage of the day's production is found satisfactory in all respects, the entire production is released for shipment.

J-M Moulded Ebony Insulation banishes breakage on LARGE Insulating Bases

MOULDED bases and parts of Moulded Ebony Insulation are now obtainable in sizes as large as 500 square inches surface area. Manufacturers of knife switches, starters or panel mounted control equipment will welcome J-M Asbestos Ebony Moulded because it eliminates the necessity of machining holes, counter bores, and slots, eliminating the breakage hazard during fabrication of other materials now in use.

J-M Moulded Ebony has high dielectric strength, is light in weight and has the special advantage that it is moisture-proof. It is free from laminations, and will not warp or shrink, crack or buckle, rot or rust under extreme service conditions.

Johns-Manville engineers will be glad to suggest the use of this material where it can do the job better and more economically than the material you are now using.



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Facts, Figures and Trends

Statistical information of value to electrical manufacturers in working out policies and plans for production and marketing

Effect of Price Cutting Upon Sales Volume

Of 849 manufacturers covered by the Federal Trade Commission in its investigation of resale price maintenance, 53.3 per cent definitely stated that, when dealers cut the price of a manufacturer's product, its distribution is decreased, 39 per cent stated that there is no appreciable effect on volume, and only 7.5 per cent indicated an increase in volume from dealer price cutting. This attitude varied, however, for among the tobacco manufacturers, 60 per cent thought that dealer price cutting had no effect, and the boot and shoe manufacturers were of the same opinion. Manufacturers of silverware and automobiles said that dealer price cutting reduced volume.

Price cutting of competitive products by dealers does not decrease sales of their own products, according to 19.3 per cent of the manufacturers, but 45.1 per cent stated that their sales are decreased by such actions; 35.6 per cent failed to reply definitely on this point.

Increase in Fuel Savings by Public Utilities

Since 1928 the electric light and power industry in this country has saved approximately 180,000 tons of coal through improved facilities, larger units, interconnection and greater efficiency. In 1919 it required nearly three and one-quarter pounds of coal to generate a kilowatt-hour of electrical energy. This had dropped to two and one-half pounds by 1922, and in 1928 it had decreased still further to a new low of one and three-quarter pounds.

Exports of Radio to Canada in 1928

Exports of radio sets and parts from this country to Canada during 1928 amounted to $5,264,642. Of this amount, radio transmitting sets and parts contributed $255,434; radio receiving sets, $2,449,666; radio tubes, $173,843; receiving set components, $1,280,602, and receiving set accessories, $1,105,097.

R. M. A. Advises Elimination of "Man-Made Static"

How to eliminate "man-made static" which causes so much unnecessary interference with radio reception and which is one of the major problems facing the radio trade is explained fully in the latest edition of the "R. M. A. Better Radio Reception Manual", recently published by the R. M. A. engineering division. Radio retailers will find the manual of incalculable value in impressing their customers with the fact that the radio industry is leaving no stone unturned to make radio reception as clear and as enjoyable as is humanly possible.

The new manual gives detailed information as to the various appliances which are liable to cause interference, how the cause of the noise can be located and, finally, how the noises can be eliminated through the installation of various types of filters. The price of the manual is twenty-five cents, and copies may be obtained from the Radio Manufacturers Association, 32 W. Randolph Street, Chicago, Ill.

That "Last Ounce"

(*Continued from page* 54)

ment. The list includes all foremen and department heads, the assistant superintendent, the office manager, the production engineer, the master mechanic, and two interesting individuals known in the Westinghouse organization as the quality engineer and the shrinkage engineer.

Some of these men—the assistant superintendent, for instance—profit in proportion to the total standing of the plant as against total bogey.

Others—obviously the shrinkage engineer is one—are rewarded in accordance with the showing in the particular bogey on which they are at work.

Each man can earn, as bonus, up to 25 per cent of his regular salary. And taking the group in the eight plants as a whole it is now getting about 70 per cent of this possible maximum. What this means to the Westinghouse company in savings, let any reader guess. On one item alone, ratio of actual expense to budgeted expense, one plant has shown a saving of $20,000 in six months of the present year.

In the payment of these bonuses, there are no "ifs, ands, and buts." If peculiar local conditions upset the labor turnover record, it is up to those in charge to find some way to offset those local tendencies if they want to earn bonus. Or if a particular large order upsets the delivery schedule and bring in a blue or red star for Customer Delivery.

Results count, and nothing but results.

To the electrical manufacturing organization, large or small, which is contemplating a similar set-up for Measuring Management, Westinghouse Lamp executives would say:

First, decide what are your cornerstones of Management. (They may be the same as ours, or they may be very different.)

Second, work out a measure for successful performance in each. There is nothing but what can in some fashion be measured relative to something else.

The next step, judging by Westinghouse experience, would be to form a temporary committee of the executives who will be responsible for the success of the plan, and get them to work out the details together. In Westinghouse's case these were the eight plant superintendents, with representatives from the general manufacturing office. In a single plant the committee might be the five most responsible line and staff men.

A meeting such as this is no tea party. That is, if it is going to amount to anything. Unless individual viewpoints of executives with differing responsibilities are fairly and fully brought out, the new set-up will be a halfway job to begin with, and perhaps unpopular when it gets going.

This doesn't mean that the whole structure must be left to the committee to work out. "Too many cooks——." The general outlines and a good many of the details will have been worked out in advance by someone representing the chief manufacturing executive. But that someone, or the chief executive himself, must be prepared to draw out individual ideas and then either to accept modifications of his own ideas or "sell" his own ideas to the group. Unanimity is improbable, and probably undesirable. But at least the new project should have the proper baptism in a flood of ideas, so that each member of the committee will feel that it is in part his "baby."

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Our machine equipment, of our own design and make, was built especially to cope with the diversified requirements of all kinds of businesses, massive or modest.

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And this service includes everything from a tiny commutator segment to a large intricate formed mica piece.

We are pleased at all times to offer our engineering services to any user or prospective user of mica.

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Electrical Manufacturing News

A department containing news, and descriptions of new materials, parts and devices for the manufacture and repair of electrical products

Light's Golden Jubilee Climax Occurs October 21

October 21, the fiftieth anniversary of Thomas A. Edison's successful completion of his experiments with incandescent lamps will bring to a close the world-wide celebration of Light's Golden Jubilee which has been in progress since early June. On this night the attention of the world will be focused on Dearborn, Mich., where Henry Ford has reconstructed, as a perpetual monument to his friend Edison, the Menlo Park of 1879.

The program itself at Dearborn on Oct. 21 is modest. Members of the party will be brought from Detroit to Dearborn during the afternoon traveling on a fifty-year-old train. During the day the Edison School and Museum will be toured along with the typical American village, a part of the Ford museum. A banquet will be served to guests in the early evening at Independence Hall.

Following the banquet, the group will retire to the Menlo Park laboratory where the climax of the great celebration will occur. There, in company with the distinguished men and women in his original laboratory, Thomas Alva Edison will reconstruct the lamp of fifty years ago and make the electrical connection which will cause it to light. The reenactment of this momentous occasion will be shared not only by the gathering in the laboratory, but also by an interested public for whose benefit a radio description will be broadcast.

In addition to the great celebration at Dearborn, arrangements have been made for local observance throughout this country and in many distant lands as well. Street parades, lighting festivals, floodlighting of public buildings and dwellings will be the order of the day and evening.

Radio Men Name Atlantic City for 1930 Trade Show

The largest industrial gathering of the United States, the annual convention and trade show of the Radio Manufacturers Association, which attracted over 32,000 persons of the radio industry to Chicago last June, is scheduled to be held in 1930 at Atlantic City, according to announcement today by Jesse B. Hawley of St. Charles, Illinois, chairman of the show committee of the R. M. A.

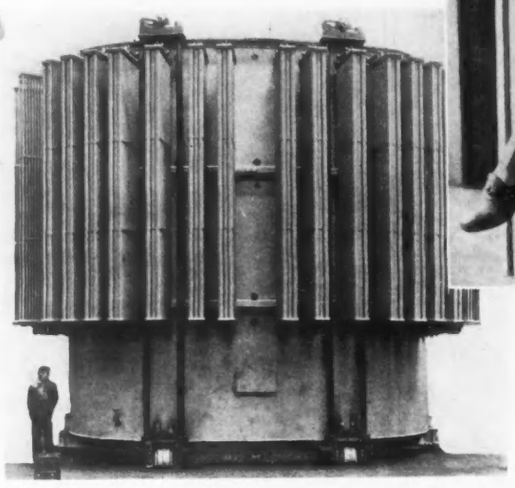
The show committee met in New York, Sept. 26, and decided unanimously upon Atlantic City for the 1930 meetings. Chicago, where the R. M. A. show has been held for the last three years, and Cleveland were strong competitors against Atlantic City. The committee's recommendation is subject to approval, which is expected to follow, by the R. M. A. board of directors.

Atlantic City won because it was believed desirable to transfer the radio gathering to the east after three years in the west, and also because of the splendid convention, exhibition and broadcasting facilities of the new $14,000,000 civic auditorium at the seashore resort.

The convention and trade show will probably be held in 1930 around June 1, the exact date to be selected later to avoid conflicts with meetings of other trade organizations.

And Both Are Called "Transformers"

TWO specially built transformers were turned out recently by the Sharon, Pa., works of the Westinghouse Electric & Manufacturing Company—one for use by the Pennsylvania Power & Light Company and the other for use by the diminutive citizens of the community of Lilliput. Note how the giant 300-ton transformer shown below dwarfs the average size man who is standing alongside



WHAT is said to be the tiniest transformer ever built weighs but a few ounces. The fair miss above easily holds it in her palm

N. E. L. A. Selects West Coast for 1930 Convention

The next annual convention of the National Electric Light Association will be held during the week of June 16, 1930, in San Francisco, was the decision reached at a meeting of the N. E. L. A. executive committee at Chicago, Sept. 18.

The question of whether or not an exhibition will be conducted in connection with the convention has not yet been decided. It is understood that the manufacturers have expressed the willingness to provide exhibits, and the association is anxious to have a show if suitable accommodations can be obtained. At the present time consideration is being given to the erection of a temporary exhibit hall adjacent to San Francisco's civic auditorium.

General Motors About to Enter Deal with R. C. A.

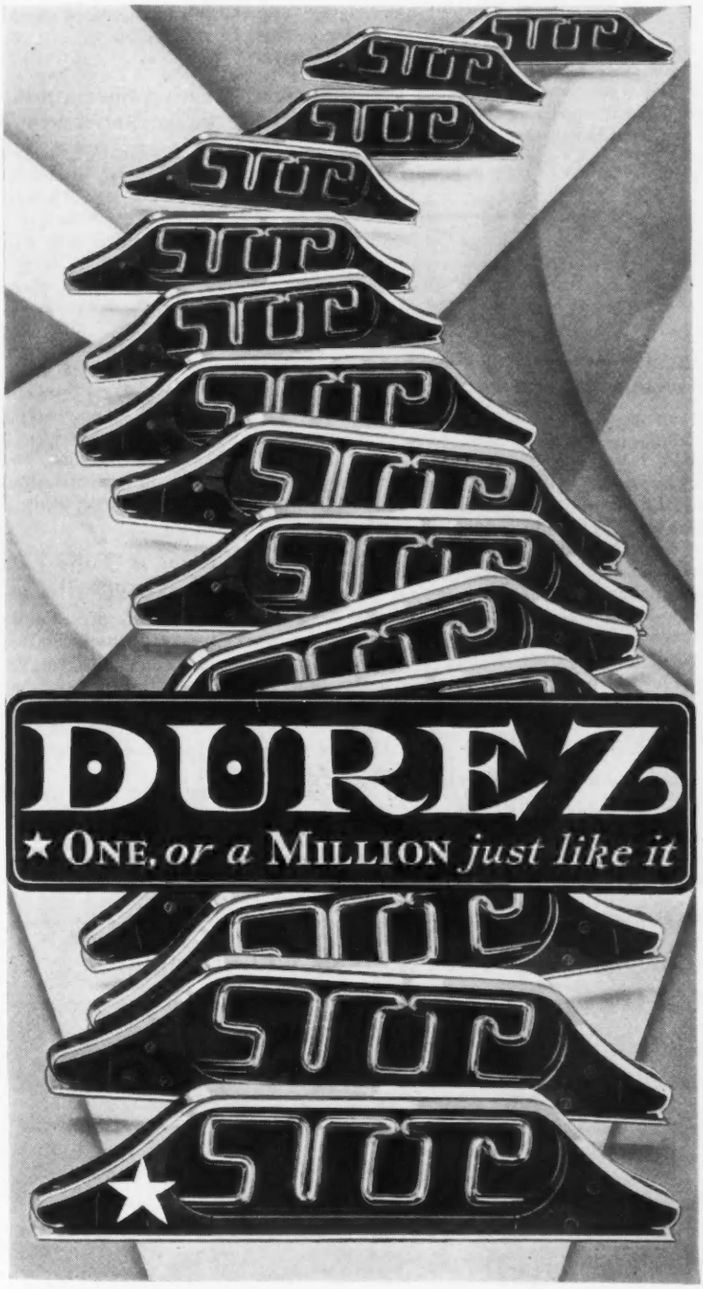
Following the entry of General Motors into the electrical equipment field through the purchase of North East Electric Company, Rochester, N. Y., in a $13,000,000 transaction, it was reported in New York recently that General Motors would soon officially announce its entry into radio. General Motors recently purchased Day-Fan Electric Company and hereafter Day-Fan receivers will be known as a product of General Motors.

It is expected that with General Motors' début in radio will come an announcement of a General Motors-R. C. A. deal, involving the formation of a new radio manufacturing company, capitalized at $10,000,000, voting control of which will be vested in General Motors, while R. C. A. will own 49 per cent of the stock. It is believed that each company will provide half of the initial capital. The proposed manufacturing subsidiary of the two companies will

Quantity production need not lower quality

... STEWART-WARNER *proved that with*

DUREZ



EVEN today, this false reasoning crops up: You can't produce on a large scale and still keep quality high. *Wrong!* You *can*... with efficient methods, of course... *and the right material!* Stewart-Warner, world's largest manufacturers of automotive accessories, produce a tremendous quantity of each product. Does their reputation for quality suffer? One look at the new neon tube stop-light will answer that! They used Durez!

Durez is quick and easy to mold. It fuses with marvelous rapidity. And when it comes from the mold, the part is finished! No tooling is necessary, no burnishing, no polishing. Finished—in one operation! In that operation, holes can be made, studs imbedded, lettering and beveling cared for. And one, ten, or a million parts will be exactly the same—without variation.

But Durez offers more than production economies. Durez is tough, hard, strong. Durez is proof against corrosion and rust; against heat, acids, oils and moisture. It has high dielectric strength. And Durez is beautiful! This perfect molding compound comes in many attractive colors that can be pebbled, blended, mottled or striated.

What material are you using? Are you sure it is the best for the purpose? Investigate Durez. Our engineering and laboratory staff will gladly co-operate with you on any experimental work or production problem. General Plastics, Inc., 109 Walck Road, North Tonawanda, New York. Also New York, Chicago, San Francisco, Los Angeles.

Write for this free booklet—"Do It With Durez." Contains complete information about Durez—physical and dielectric properties, color ranges, and scores of possible applications.

distribute its products through the various retail distributing outlets of General Motors, including the Delco-Remy and Frigidaire units.

The entry of General Motors into radio will tend to even the seasonal character of its merchandising. The spring and summer automobile selling season will logically balance the fall and winter radio selling activity.

Radio Tube Base Standard Approved by A.S.A.

A national standard for radio tube bases has just been formally approved by the American Standards Association following the preparation of the standard by a technical committee under the chairmanship of Dr. Alfred N. Goldsmith, vice-president of the Radio Corporation of America. This is the first authoritative national standard for radio equipment. The Institute of Radio Engineers and the American Institute of Electrical Engineers are playing a leading part in the standardization work.

The standard provides that the large pins of the tube bases shall be 0.156 inches in diameter, and the small pins 0.125 inches in diameter. This applies to both the large and small types of tubes. The standard also provides that the diameters of the pins must not be more than 0.003 inches larger or smaller than the normal. Standards are also set up for the dimensions of the bases and the position of the pins. The large pins, it is stipulated, shall connect with the filament. The standard states which small pin shall connect with the plate, and which with the grid.

Nineteen national organizations are represented on the radio committee which is preparing unified national standards for radio apparatus under the auspices of the American Standards Association. In addition to standards for vacuum tubes, the committee is working on standards for transmitting and receiving sets and installations, component parts and wiring, electro-acoustic devices, and power supply and outside plant.

Electrical Export Rise Shown in Latest Figures

Exports of electrical apparatus from the United States during July, 1929, totaled $12,891,948, as compared with $9,919,988 during the same month of 1928 according to figures released by the Electrical Division, Bureau of Foreign and Domestic Commerce, Department of Commerce. Exports during the first seven months of this year amounted to $83,669,418, as compared with $63,186,854 for the same period a year ago.

Refrigeration sets up to one-quarter ton capacity, totaling $1,020,891, represented the greatest export sum for any single classification during July. Radio receiving sets, total $767,394, stand second; insulated copper wire and cable, total $504,612, third; stationary motors, one to two hundred horsepower, total $449,585, fourth; and telephone equipment, other than instruments and switchboards, total $413,063,- fifth.

Canada again stood first during July as the favorite destination for American electrical exports, total $3,876,794. The largest single electrical item imported into the United States during July came from Japan: 5,056,360 miniature carbon filaments for electric lamps, value $139,325.

NEMA Meeting in Session

Election of officers, board of governors and section chairmen, as well as addresses by a number of prominent speakers featured the annual meeting of the National Electric Manufacturers Association which was held at the Wardman Park Hotel, Washington, D. C., and which was about to begin when this issue of Electrical Manufacturing went to press.

A complete account of the meeting, the new officers and also the results of the trade practice conference schedule will appear in the November issue of Electrical Manufacturing.

Marion Insulated Wire Purchased by Anaconda Wire & Cable

The assets of the Marion Insulated Wire & Rubber Company, Marion, Ind., have been purchased by the Anaconda Wire & Cable Company, according to a recent announcement. In the future this mill will be operated as the Marion Mill of the Anaconda Wire & Cable Company with J. F. Auten as manager. The Marion Company has been manufacturing a complete line of rubber insulated wire and cable as well as parkway and varnished cambric cables, over a period of many years. It is understood that the present plans indicate a large expansion of the present Marion manufacturing facilities.

Cleveland Chosen for Meeting of Battery Manufacturers

Manufacturers of storage batteries will be afforded an opportunity to meet and discuss with each other the various problems now facing the industry at the annual meeting of the National Battery Manufacturers Association. W. J. Parker, commissioner of the association, has completed arrangements at the Hollenden Hotel, Cleveland, for the official headquarters during the convention which will be held Oct. 24 and 25. The program committee is now at work on an interesting business program for the two-day session. Several members of the United States Chamber of Commerce, as well as other prominent speakers, are to be present, and various technical subjects will be discussed as well as the problem of standardization.

Industrial Heating Specialties Manufactured by New Firm

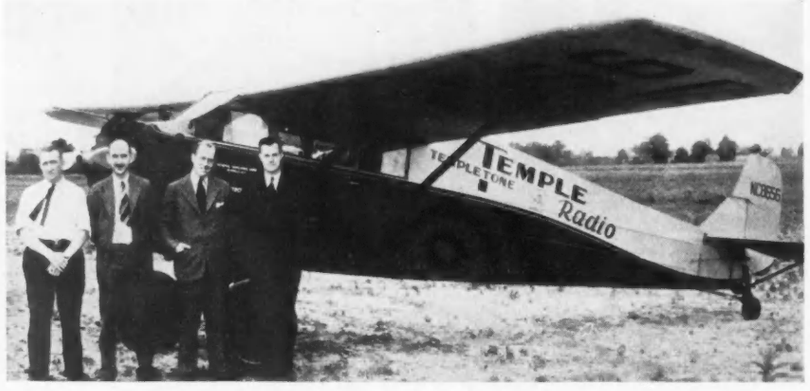
Lydon Brothers is the name of the new firm manufacturing industrial ovens and industrial heating specialties at 229 Colden St., Jersey City, N. J. The company was formed by Timothy Lydon, formerly with the Young Brothers Company, Detroit, manufacturer of the same type of equipment. He was a member of the Young Brothers drafting staff for a time and later was appointed district sales manager in the Cleveland territory. For the past two years he was general manager in charge of sales as well as engineering and manufacturing for E. E. Steiner & Company, Newark, N. J. He has had considerable experience in the industrial oven and heating and ventilating fields.

Youngstown Steel & Tube Co. Honors J. A. Campbell

A dinner to J. A. Campbell, president of the Youngstown Sheet & Tube Company, Youngstown, Ohio, was tendered on the occasion of his seventy-fifth birthday, Sept. 11. More than three hundred of Mr. Campbell's friends were present at the Ohio Hotel, among them the leading residents of Youngstown.

Mr. Campbell was born in Trumbull County, Ohio, in 1854. He attended the public schools of the county and entered Hiram College following which he received an appointment as a cadet to the West

Conquering New Altitudes with Temple



THE "Temple of the Air" cabin monoplane which is making a cross country sales promotion tour is shown after arriving at Evansville, Ind. With the plane above are, left to right: Lieut. Frank Hoffman, pilot; Cliff Bettinger, sales promotion manager; Gabriel Tolan, publicity director; and Chas. Muntzer, a local Temple dealer.

Better Motors because of the Westinghouse RADIO TEST

IN choosing an electric motor, you are careful to see that it is sturdy and strong. Be equally careful to see that it has been thoroughly tested. In every Westinghouse Industrial Motor, the searching fingers of high frequency electric currents—the same kind of current that is used in radio broadcasting—find any hidden defects in the hearts of coils where ordinary testing methods would fail. This test is one step in the Westinghouse manufacturing system.

Westinghouse Electric & Manufacturing Company
East Pittsburgh Pennsylvania

Sales Offices in all Principal Cities of the United States and Foreign Countries

Westinghouse

T 30365

Point Military Academy. Circumstances prevented him from embracing a military career. Instead he became a clerk in a Youngstown coal office. He became identified with the steel business in 1890 as superintendent of a small iron mill. His advancement was rapid and he soon was promoted to district superintendent of the Republic Iron & Steel Company. Resigning this position he organized the Youngstown Sheet & Tube Company in 1900. Mr. Campbell was at first general manager of the new concern, but in 1904 was elected president and has held this position continuously since that time. The organization has arisen from a company with a capital of $600,000 and only 46 stockholders to one which now has resources totalling $300,000,000 and more than 5000 stockholders.

Broadcast Features and Laws Discussed by R. M. A.

Stimulation of new and improved broadcasting features for the radio public, including measures to insure public reception of prominent events, which some private promoters are reluctant to release over the air, was planned by the board of directors of the Radio Manufacturers Association at a meeting during Radio World's Fair Week in New York. Convinced that broadcasting of baseball, boxing contests and other sports events actually increases paid attendance at such events, the radio men considered steps to prevent the loss of such outstanding features to the radio public.

Except for the probable continuation of the Federal Radio Commission for another year comparatively little important radio legislation is expected during the recent session of Congress, according to the R. M. A. board. The plan presented by the R. M. A. legislative committee to establish an information service in connection with all radio legislation in the states and important cities, was approved by the board. This information service, already organized in more than half of the states, includes the appointment of chairmen from the ranks of manufacturers, wholesalers or dealers, and organization in each state of committees to advise the R. M. A. central office of the new radio legislation which is proposed.

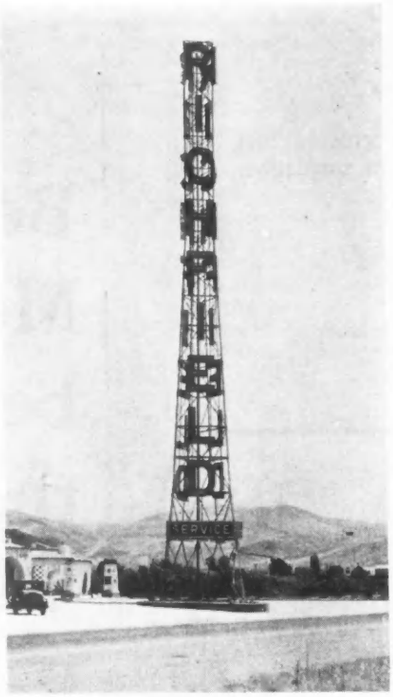
Square D Company Is Host to Electrical Inspectors

A thorough trip through the plant of the Square D Company, Detroit, was the feature of the last day's meeting of the Western Section, International Association of Inspectors, during its annual convention, Aug. 26-29. Four special buses were chartered by the Square D Company to transport the inspectors and members of their party from their downtown headquarters to the Square D factory. The inspection trip included a visit to the company's display room, in which every Square D product is attractively arranged for showing to all visitors. The front of the Square D office building and plant was brightly decorated with flags and "welcome" emblazoned above the entrance in large letters.

Beg Your Pardon

In the September issue of Electrical Manufacturing it was erroneously reported that Arlington Bensel, vice-president in charge of sales for the Gilby Wire Company, Newark, N. J., entered the employ of the Driver-Harris Company, also of Newark, in 1895. Mr. Bensel joined that company in 1905.

Aerial Beacons Going Up



ALONG the Pacific Coast, from Canada to Mexico, a chain of neon aerial beacons is being built. They are 127 feet high and are seen 50 miles in clear weather

Monowatt Electric Corporation Merges Three Firms

Monowatt Electric Corporation, Bridgeport, Conn., has been formed to take over the business and plants of Monowatt Corporation, New York; Connecticut Molded Products Company, Meriden, Conn., and New England Metal Products Company, also of Meriden. The new organization, headed by S. C. Caswell, president, now has full manufacturing and warehousing facilities to produce a complete line of wire and cable, lamp cords and wiring devices.

Monowatt Electric Corporation will operate its own factory for the production of hot and cold molded products as well as a plant adapted especially for the fabrication of the brass parts required in the manufacturing of wiring devices. The company's sales office at 24 West Fortieth St., New York, and at Chicago, will be continued.

Beside Mr. Caswell, the officers of the company are: vice-president and factory superintendent, R. E. Coleman; treasurer, G. H. Schill; commercial vice-president, A. F. Warren; in charge of sales to central stations, drug syndicates and department stores, L. Dorflinger; sales to variety syndicates, R. E. Andrews; in charge of plastic products, warehousing and exports, H. B. Zeiger, and in charge of production, George Fitzgerald.

General Utilities Manufactures Washer and Towel

General Utilities Manufacturing Company, 4058 Beaufait Ave., Detroit, is the name for Sunnyline Appliances, Incorporated, and American Air Dry Corporation, both of which have been taken over by the McCord Radiator and Manufacturing Company. The products of both organizations will be sold under the name of General Utilities Manufacturing Company and will be continued to be manufactured as heretofore. Sunnyline Appliances has manufactured a washing machine and American Air Dry an electric towel. E. L. Carter has been named general manager of the General Utilities Manufacturing Company.

Atwater Kent Sales Manager Leaves for Abroad

Vernon W. Collamore, general sales manager, Atwater Kent Manufacturing Company, sailed for Europe Sept. 27 on the steamship Homeric. He was accompanied by Mrs. Collamore. He plans to stay abroad for about sixty days, during which time he will visit England, Spain, France, Italy, Germany and Belgium to obtain first-hand information on the foreign radio field.

Copeland Products Names Race Sales Promotion Head

William S. Race, formerly assistant advertising manager of Copeland Products, Inc., has been appointed as manager of advertising and sales promotion, according to an announcement by W. D. McElhinny, vice-president in charge of sales, Copeland Products.

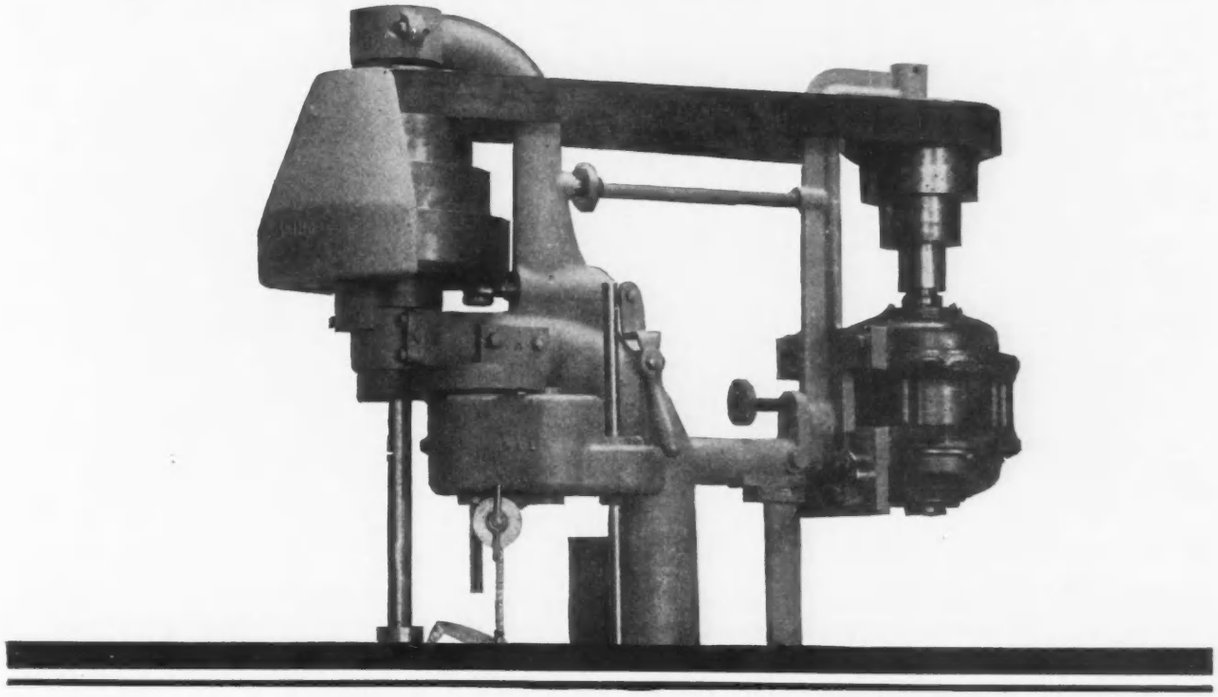
William S. Race

Before joining the Copeland organization, Mr. Race was connected with U. S. Rubber Company, Briggs Manufacturing Company and Hudson Motor Car Company. He is a graduate of University of Texas engineering and journalism schools. He later attended post-graduate sessions in advertising and sales promotion at Columbia University, New York.

President of Taft-Pierce Dies Suddenly

Louis Vaughn Hubbard, president of the Taft-Pierce Company, Woonsocket, R. I., manufacturer of tools, dies and engineering instruments, died suddenly

NEW DEPARTURE



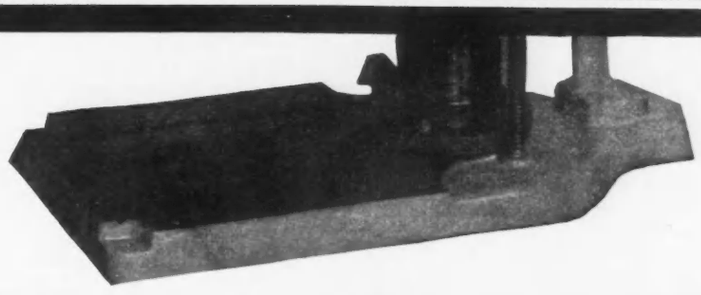
Ball bearings make this mounting possible

HERE is an individual drive made simple, economical and compact by the use of New Departure Ball Bearings in the G. E. Motor. Vertical motor mountings are easy when New Departures are employed and usually result in decided advantages. Here, for instance, it makes possible a short, straight belt-drive, free from twist. Then, too, the use of horizontal motor parts mounted vertically allows a simple and rigid motor bracket. The bearing housings contain sufficient grease to insure long service without replenishment.

New Departures carry loads, radial and thrust, with true rolling motion, and never need adjustment or readjustment.

Let us tell you how and why New Departures are becoming so popular in the electric motor field. A request will bring the proof in "Booklet K."

The New Departure Mfg. Company, Bristol, Connecticut; Detroit, Chicago and San Francisco.



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BALL BEARINGS

at his home in Montclair, N. J., on September 25. He was 63 years of age.

Mr. Hubbard was born in Malone, N. Y., and was educated at Amherst College. He graduated from the New York Law School in 1899 and entered a law firm in New York. In addition to being president of the Taft-Pierce Company he was also auditor of the General Electric Company at Schenectady.

Allis-Chalmers Makes Special Offer to Stockholders

Directors of the Allis-Chalmers Manufacturing Company, Milwaukee, have authorized an offering to stockholders of one additional share at 60 for each 10 held on Oct. 10. The offer will close Oct. 31. The offering will require the issuance of 114,400 additional shares and from it the company will realize $6,684,000. The major portion of the amount will be used for expansion of the present plants of the company, especially those at West Allis and Springfield, Ill.

W. S. Rugg Appointed to Edison Medal Committee

W. S. Rugg, vice-president, Westinghouse Electric & Manufacturing Company, has been appointed to the committee for the award, during the next five years of the Edison Medal, given by the American Institute of Electrical Engineers. L. W. Morrow, editor of *Electrical World*, and R. F. Schuchardt, Commonwealth Edison Company, were also named. Samuel Insull of Chicago is chairman of the committee.

W. S. Rugg

The Edison Medal, established in 1909, is awarded yearly for meritorious achievements in electrical science, engineering or arts. Its recipients include the nation's greatest electrical engineers: Elihu Thompson, Frank J. Sprague, George Westinghouse, William Stanley, Charles F. Brush, Alexander Graham Bell, Nikola Tesla, Benjamin G. Lamme and Michael Pupin.

Brevities

Cutler Hammer Manufacturing Company, Milwaukee, manufacturer of electrical control devices and equipment, with New York branch at 8 W. Fortieth St., is having plans drawn for a six-story addition to its New York works at Southern Blvd. and 144th St., to cost $300,000 with equipment.

Airport Lighting, Inc., 10 E. Fortieth St., New York, was recently organized under Delaware laws with a capital of 100,000 shares of stock, no par value, to operate a plant for the manufacture of automatic electric lighting equipment for night landings at airports. The company is headed by F. G. Ericson.

American Transformer Company, 178 Emmet St., Newark, manufacturer of transformers for electric power and radio servcie, will construct a two-story addition to its plant to cost about $40,000 fully equipped.

Ever-Sun Arc Lamp Co., Inc., 4550 Fulton St., Chicago, announces that Henry A. Dormeyer, president of the MacLeod Manufacturing Co., Inc., of Chicago, for the past fifteen years, has become associated with the Ever-Sun organization.

Servel Sales, Inc., has appointed as advertising and sales promotion manager of the Servel Products Division, A. T. Golding. This division handles all refrigeration equipment of the electrical compression type, both domestic and commercial. Mr. Golding joined Servel in May, 1928.

Sleeper & Hartley, Inc., Worcester, Mass., has entered into an exclusive agreement with the Strand Enamel Company of Winsted, Conn., to manufacture and sell wire enameling machines formerly marketed by R. E. Strand. The first lot of these machines is now being built in the Worcester plant of Sleeper & Hartley, Inc.

The Paine Company, 2949 Carroll Ave., Chicago, recently completed additions to its quarters, increasing manufacturing space, warehouse facilities and office quarters. Additional equipment is being installed to take care of increased production of Paine products.

Copperweld Steel Company, Glassport, Penn., announces the resignation of J. M. Roth, chairman of the board, who has been associated with the company in various capacities since it was founded. Mr. Roth is the inventor of the hot molten welding process patent on Copperweld wire and other products. He has been succeeded by Harrison Nesbit, president of the Bank of Pittsburgh, who has been a Copperweld director for some time. Frank R. Frost, president of the Superior Steel Corporation, Pittsburgh, has also been made a director of the Copperweld Company.

General Cable Corporation, Graybar Bldg., New York, has purchased the plant at Kingsland Ave. and Hamilton St., Harrison, N. J., now occupied by the A-A Wire Co., manufacturer of insulated wire and cable. The floor space purchased totals 160,000 sq. ft. which will be developed as the permanent plant for the A-A unit. The property was originally built and occupied by the New Jersey Tube Works.

Standard Underground Cable Company, Pittsburgh, has awarded a contract for a two-story addition to its plant at Perth Amboy, N. J., to cost about $50,000 completely equipped. Part of the Pittsburgh works will be removed to the new structure.

Sylvania Products Company, Emporium, Pa., manufacturer of radio tubes and equipment, is completing a new three-story addition, 80 x 200 ft. and is about to install equipment which will give employment to about 300 additional workers. The expansion will cost about $100,000 with machinery.

Telkor, Inc., Elyria, Ohio, is now manufacturing the Telkor armored cable cutter formerly manufactured by the Colson Company, also of Elyria.

Apex Electrical Manufacturing Company, Cleveland, has purchased the Johnson Washer Company of Oakland, Cal. The products formerly manufactured and distributed under the "Johnson" name will be continued along with the Apex-Rotorex appliances. This new addition makes the sixth plant owned and operated by the Apex Electrical Manufacturing Company, all of which are engaged in the manufacture of Apex & Rotorex washers, ironers, cleaners, motors, ventilating fans and grinders. The Oakland factory will be under the management of G. B. Schuyler, who has long been associated with the Johnson Washer Company.

Art Fixtures, Inc., is the name of a new manufacturer of modern art lighting fixtures and lanterns organized by David Berg, formerly of the Ruby Lamp Company, New York. The new firm is located at 88 University Place, New York City.

Julian P. Friez & Sons, Inc., 4 No. Cathedral St., Baltimore, manufacturer of scientific instruments and subsidiary

Coming Conventions

American Institute of Electrical Engineers.—Annual winter meeting at New York City, Jan. 27-31, 1930.

American Society of Mechanical Engineers.—Annual meeting at New York City, Dec. 2-6.

American Society of Heating and Ventilating Engineers.—Annual meeting in Philadelphia, Jan. 27-31, 1930. During the same week, International Heating and Ventilating Exposition at the Commercial Museum, Philadelphia.

Eighth National Exposition of Power and Mechanical Engineering.—Grand Central Palace, New York, Dec. 2-7.

National Electrical Exposition.—Grand Central Palace, New York, Oct. 7-12.

National Battery Manufacturers Association.—Annual meeting at the Hollenden Hotel, Cleveland, Oct. 24-25.

National Electric Light Association.—Annual convention, San Francisco, Cal., week of June 16, 1930.

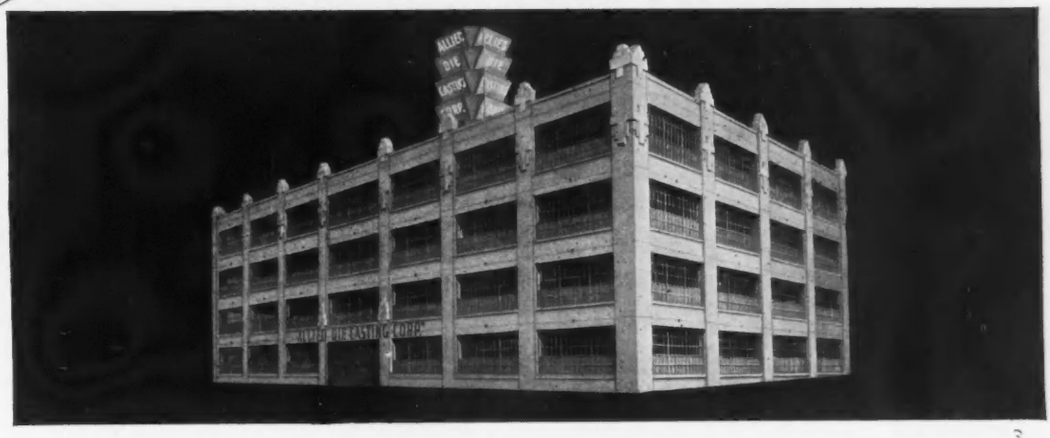
National Electrical Manufacturers Association.—Annual fall meeting at the Wardman Park Hotel, Washington, D. C., Oct. 7-12.

Radio Manufacturers Association.—Annual convention and exhibition, at Atlantic City, N. J., early part of June (exact date soon to be announced).

World Engineering Congress.—Tokio, Japan, beginning Oct. 30.

ALLIED DIE-CAST

The Model Die-Casting Plant!



Announcing

THE MOST MODERN DIE-CASTING PLANT

In Structure—Equipment—Methods and Personnel
Allied sets a new standard for the industry

The opening of the newly constructed plant of the Allied Die-Casting Corporation places at the disposal of all users of die castings, the many advantages possible through the combination of every modern facility.

This large plant, the newest and most up-to-date of its kind today, is devoted to two services: The more economical and more efficient production of finer die castings, and the production of the most modern die casting machinery and its installation and servicing in manufacturing plants.

This new, model plant offers to manufacturers an unsurpassed organization for the manufacture of exceptionally delicate, intricate and involved die castings, in which strength, accuracy and fine finish are inherent qualities.

The new Allied building has been deliberately planned, designed and built for just one purpose—to permit the most economical production of high quality die castings, by embodying every natural and physical advantage in its construction.

To this model structure has been added equipment chosen after exhaustive tests—only. None but the finest has been used. The great capacity of these high speed tools will be utilized to the utmost in the hands of skilled Allied artisans, producing the natural result when experienced workmen use fine tools.

As to methods—for many years Allied has successfully die cast parts that had been declared impossible to the art. These methods are now continued in the new plant under ideal conditions that make possible even greater developments in the science of die casting.

The Allied personnel is progressive. Old in die casting experience—but young in ability to accept new problems and new facts, to discard old costly methods and to be constantly alert to any factor that will make it possible to produce better die castings more efficiently and at lower cost.

The entire Allied model organization, as well as the staff of engineers, which has been so successful in the solution of production and die casting problems for some of the largest industries in the country, is at your command for consultation at any time.

E. N. Dallin
President.

ALLIED DIE-CASTING CORP.
Long Island City, N. Y.

of Consolidated Instrument Company of America, Inc., has completed plans for the erection of a new plant for the manufacture of instruments and parts, to cost over $50,000 fully equipped.

Sylvania Products Company, Emporium, Pa., announces that Roger M. Wise, who was seven years Chief Engineer of E. T. Cunningham, Inc., is now connected with Sylvania in a similar capacity. He is a native of Ft. Wayne, Ind., and received his technical training at the University of California where he earned his degree as an electrical engineer. He was for a time connected with the Bureau of Standards at Washington.

Walker Electric Corporation, St. Louis, has appointed as branch manager of the St. Louis Sales Office, J. B. Holston. After graduating from the University of Illinois in 1923, Mr. Holston joined the Walker organization as student engineer, following which he became a specialty salesman in the Chicago territory.

National Radio Tube Corporation, 1890 E. 40th St., Cleveland, is the new name for the Quinn Tube Company.

Aircraft Radio Corporation has been organized as a subsidiary of the Steinite Radio Company, Fort Wayne, Ind., to manufacture a specially designed receiving set for airplanes, as well as a direct current set for automobiles. Direct current sets will also be manufactured for the extensive farm market. The company will operate under the direction of Fred W. Stein.

Kellogg Switchboard & Supply Company, Chicago, announces the establishment of a factory branch which will market Kellogg Screen-Grid Receivers in the Cleveland territory. Office and warehouse located at 1531 W. Twenty-fifth St., Cleveland, will be in charge of F. W. Lorenz, formerly sales representative for the Ohio territory. Assisting Mr. Lorenz will be Messrs. Shibler and Moran.

Time-O-Stat Controls Company, Elkhart, Ind., reports for the six months ended June 30, 1929, net sales of $724,142 or more than 66 per cent greater than in the same period of 1928.

Information Wanted

We have been asked for the names and addresses of manufacturers of the articles listed herewith.

Replies from our readers to any of these inquiries will be greatly appreciated by the Information Bureau of Electrical Manufacturing, 461 Eighth Avenue, New York City.

"Parker" Canopy Insulating Block.
"Burrows" Therapeutic Lamp.
"L. R. Co." Receptacles.
"Williams" Commutator Dressing.
"Splendida" Electric Iron.
"Flint" Waffle Iron.
"Pioneer" House Pump.
"Blaisdell" Electric Cigar Lighter.
"Defiance" Cigarette Lighter.
"Hillcrest" Line of Lighting Fixtures.
"Vesodore" Cigar Lighter.
"Thermodyne" Therapeutic Lamp.
"Medsco Beauty" Iron.
"Seco" Plug Fuses.
Electromatic Traffic Dispatch Co.
"Aspinall" Soldering Fluid.
Electric-driven lampshade lacing machines.

New Goods for Your Inspection

All-Purpose Electric Sprayit

The Electric Sprayit Company of South Bend, Indiana, announce an All-Purpose Model Electric Sprayit to round out their

line of hand portable spraying equipment. This new model was designed to meet the demand for a moderately priced hand portable sprayer with a pressure feed container suitable for covering wide surfaces quickly and for all types of commercial and production work that can not be handled advantageously with a cup-gun outfit.

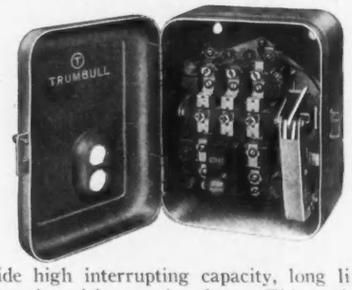
The All-Purpose Electric Sprayit consists of a sturdy rotary compressor of special design, operated through a direct drive by a 1/4 h.p. motor. The compressor delivers a constant unvarying air volume of 5 cubic feet per minute. This high volume of air does away with the necessity of a cumbersome air storage tank. The pressure feed tank holds approximately 2 gallons of material which will cover about 700 square feet of surface. A one quart container is also furnished and can be quickly connected to the gun for small touch up and trimming jobs. A highly efficient commercial gun completes the equipment.

The complete outfit weighs approximately 50 pounds and can be readily carried to any job. Twelve feet of electric cable and 20 feet of rubber hose between the compressor and the container makes any job easily accessible. Longer cable or hose can, of course, be used. Eight feet of air and paint hose connect the gun to the container. Special attention has been given to the matter of excessive mist or fog and this objectionable feature is said to have been eliminated.

The All-Purpose Electric Sprayit is also furnished with a gasoline engine for use where electric current is not available. This self powered unit is of the same compact design as the electric model and weighs approximately 70 pounds. A 3/4 h.p. air-cooled engine of high efficiency was designed especially for this service.

Circle T Magnet Switches

Trumball Elec. Mfg. Co., Plainville, Conn., announces its Type M-7½ Circle T line of magnet switches, designed to pro-



vide high interrupting capacity, long life, ease in wiring, and safety. This switch is provided with duo-break contacts, which the manufacturer states reduces the arc to 1/20th in. of the usual single break construction. Horse power rating of switches range from 1½ h.p. at 115 volts to 5 h.p. at 575 volts, and of polyphase switches from 3 h.p. at 115 volts to 7½ h.p. at 575 volts. Control is local, remote, or automatic. The switch measures 6½ in. by 8½ in. by 4 1/16 in.

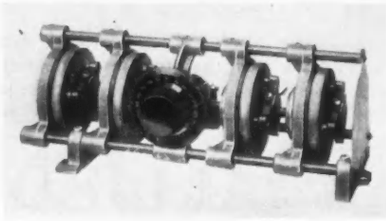
Noark Meter Switches

Colt's Patent Fire Arms Mfg. Co., Hartford, Conn., announces its Noark 30 amp. accessible fuse type meter service

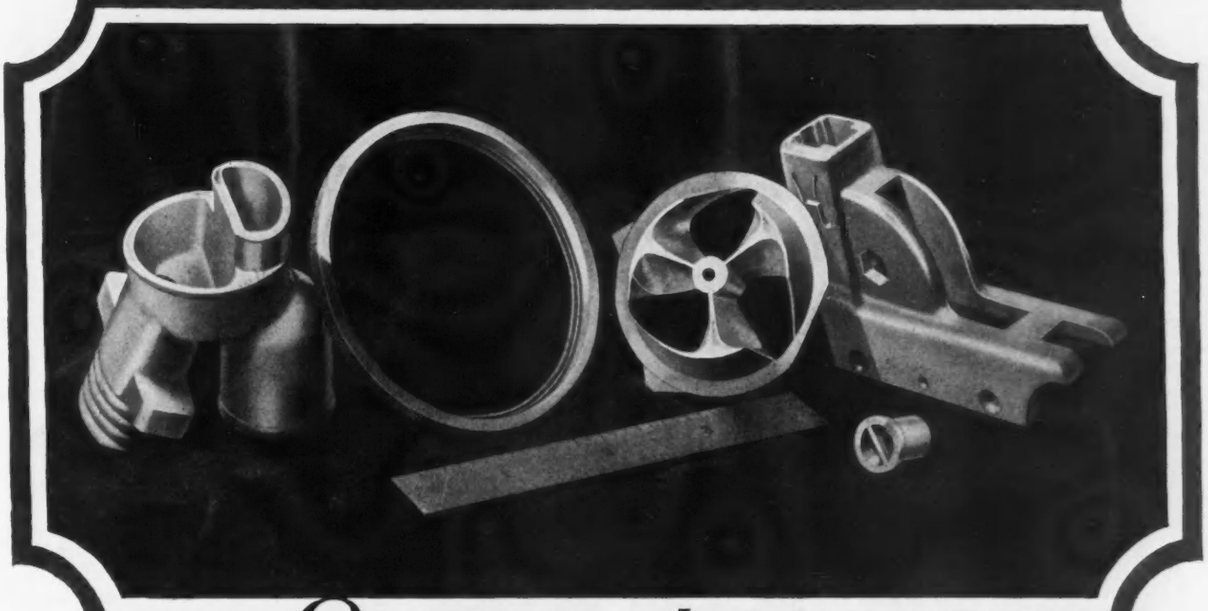
switch with an improved cover. With this switch it is only necessary to slide the cover of the fuse compartment a distance less than the width of the handle. This switch is thus a space-saver in that it makes possible gauging the switches closer together than when it was necessary to slide the cover of the fuse compartment nearly the width of the box.

Die-Cast Gang Condenser

Furnell Sales Corp., 16 Hudson St., New York, announces its die-cast gang condenser. Each condenser is made of



two die-cast pieces each consisting of a round, flat disk on which is cast a number of concentric, cylindrical rings. The rings



Soundness

There is nothing more easy to claim, nor more difficult to maintain, than Quality. Yet Newton Quality is tangible, if the evidence of a maintained enthusiasm on the part of old customers carries weight. Continued preference with experienced buyers and the increasing number of new customers justifies our confidence in the soundness of our adherance to the standards of quality and service which have established the name Newton as having a definite meaning.

The NEWTON DIE CASTING Corp'n.

146 Munson St. NEWTON NEW HAVEN New Haven, Conn.

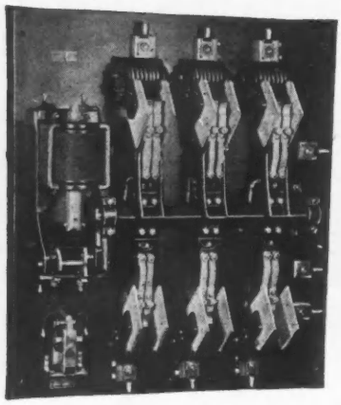
of one of these pieces telescope the rings of the other pieces, leaving an air space between rings to serve as a dialectric.

One half of each condenser is mounted on a frame, and the other half is mounted on a heavy shaft which passes through the center of each condenser. By the use of a cam arrangement attached to the dial, the shaft may be adjusted so as to vary the distance between the two parts of each condenser, thus varying the capacity.

The dial has an effective adjustment range of 360 degrees. The manufacturer states that this type of construction makes possible absolute uniformity, and that vibration of plates or short circuits are eliminated.

Automatic Transfer Switches

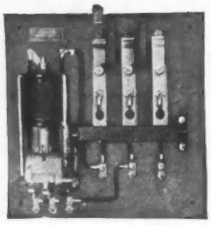
Automatic Switch Co., 154 Grand St., New York, announces its line VDMSR automatic transfer switches used for emer-



gency lighting circuits in hospitals, theaters, auditoriums, power stations, factories and office buildings, and for maintaining power for operating stock tickers, moving picture studios, raido broadcasting stations, and for operating important motor-driven machinery. In general they are used where continuous current supply is necessary. Ampere ratings range from 15 to 400 amperes, shipping weights from 30 to 220 lb. They are available in two or three-pole combinations, and in D. C. voltages of 115 or 230 volts, or A. C. voltages of 110 or 220 volts, 25 to 60 cycles.

Remote Control Switches

Automatic Switch Co., 154 Grand St., New York, offers the trade its Type VDMS line of remote control switches,



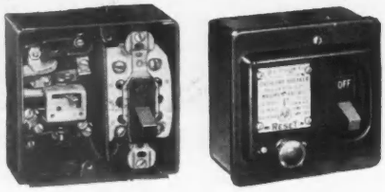
for general application. These switches are available in ampere ratings from 15 to 400 amperes, and in voltages of 115 to 230 volts D. C., and 110 or 220 volts A. C., 25 to 60 cycles. Two and three-pole combinations are furnished. The operating current for these switches is applied for approximately one-fifth of a second, and varies from 1 ampere in small operating unit, to 4 amperes in the largest unit. Wiring is said to be extremely simple. When these switches are furnished with instrument control, the relay is mounted on the panel, and all inter-connections are made at the factory.

Patent Snap Switch

The Hoosick Falls Radio & Parts Mfg. Co., Hoosick Falls, N. Y., is marketing a combination patent snap switch and triple convenience outlet for use with household appliances. The switch, known as catalog No. 736, is approved by the Underwriters and is designed to increase the handiness of different appliances by bringing the control of the current nearer to the operator. The case is cold mold in rich brown. The lever designates "off" and "on" positions. It is shipped in individual boxes, ten to the carton.

Small Overload Breakers

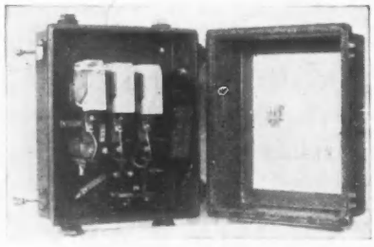
Allen-Bradley Co., 493 Clinton Ave., Milwaukee, Wis., offers the trade a line of overload breakers for fractional horse-



power D.C. and A.C. single-phase and polyphase motors. Protection is afforded against motor burn-outs and overloads. These breakers have a maximum rating of 1 h.p. at 125 volts, and 1½ h.p. at 220 volts, and may be obtained with or without snap switch or fuse clips. Six forms satisfy all industrial applications.

Dust-Tight Linestarter

The Westinghouse Electric and Manufacturing Company announces a line of dust-tight and weather proof linestarters.



They are remote controlled, non-reversing, across-the-line type magnetic starters for single phase and polyphase squirrel-cage induction motors. These starters are especially adaptable for use in coke plants, cement mills, steel mills, and other places where a dust-tight starter is very desirable.

Several features have been added to the standard line to insure the continuous and efficient operation of linestarters. It differs from the other types in its cabinet construction in that a cast iron cabinet is used with a gasket seal on the door. The conduit is brought in through the top and bottom in threaded openings so as to make a dust tight connection. These features make the cabinet dust-proof and water-proof.

To prevent the operator from breaking the seal whenever the motor is put back into service after an overload, the two small size linestarters are equipped with an automatic reset thermal overload relay. This relay has interchangeable heaters, and accessible calibration lever, and quick make and break contacts.

The dust-tight linestarter is now available in three sizes up to 50 horsepower.

Tinning Pot

Harold E. Trent Co., 439 N. 12th St., Philadelphia, is marketing an electric tin-

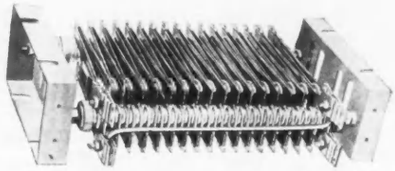
ning pot, designed for 110 volts and for single heat. The wattage is 375 A.C. and D.C. The pot measures 4 in. inside diameter, by ½-in. deep. The depth can be made ⅛-in. deep on special order. The device is supplied complete with attachment cord and plug of the usual type.

Arrotex Attachment Plug

Arrow Electrical Division of Arrow-Hart & Hegeman Electric Co., Hartford, Conn., has put on the market its Arrotex Bakelite attachment plug No. 1900. The body incorporates a finding ridge in its design, which is of assistance when inserting attachment plug caps. The cap incorporates the same decorative design as the Arrotex plates.

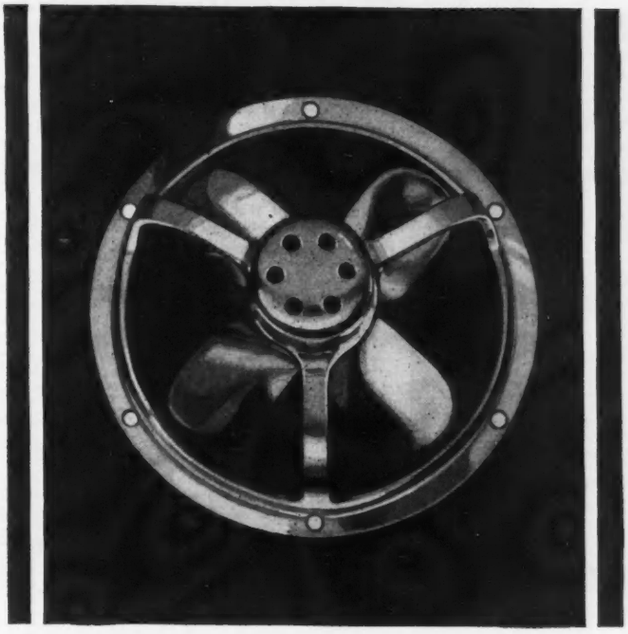
Dur-ristor Resistor

Cutler-Hammer, Inc., Milwaukee, Wis., is marketing its Dur-ristor, an unbreakable resistor with a continuous resistance ele-



ment. It is said to be vibration-proof, non-corrodible, light and compact. All insulation is of mica. No brittle material is used in construction of this resistor. Ampere ratings vary, but the size is constant. Dur-ristor is adaptable for any standardization plan for resistor banks and is finding wide application for use with equipment where minimum resistor maintainance is required, and where severe operating conditions are encountered.

BEAUTY *and* ACCURACY

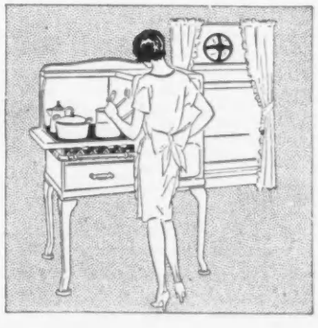


TWO FEATURES THAT IDENTIFY STEWART DIE CASTINGS

▼

Note the neat, smoothly finished appearance of this durable ventilator fan housing and perfectly balanced fan.

Over and above the recognized production economies brought about by the use of die cast parts, Stewart offers the utmost in beauty and accuracy of detail. Smooth perfection of finish and simplified design arethe basic factors in the modern conception of mechanical beauty. Consequently Stewart Die Castings —strong, light weight and accurate to the thousandth of an inch—please the discriminating manufacturer. He sees in them the answer to the insistent demand for Appearance.



Stewart Die Castings produce as a single unit what would otherwise be a complicated assembly. They eliminate machining and handling expenditures, measurably reduce unit costs and simplify manufacturing operations.

A Stewart engineer will be glad to call and discuss your requirements with you, or we will submit definite information upon receipt of blue prints or samples of your present production.

Stewart

THE STEWART DIE-CASTING CORPORATION

4500 Fullerton Avenue, Chicago, Illinois

Detroit ◆ Pittsburg ◆ Dayton ◆ St. Louis
Newark ◆ Cleveland

Index of Raw Materials, Parts, Electrical Equipment

For all electrical products including electrically operated machines and appliances

Trade Names—Manufacturers' Names—Local Addresses

The names of all manufacturers are grouped alphabetically under the heading for the product they manufacture. Trade names also appear in alphabetical position under the subject identifying the product. Thus "Linolac" insulating varnish will be found in alphabetical position under the heading "Paint, Varnish, Lacquer."

Note: The Classified Index of ELECTRICAL MANUFACTURING is limited to those subjects of interest to the specific field which it covers, for obvious reasons. A complete Classified Index of all electrical commodities bought, sold, or used by Electrical Supply Jobbers, Contractors, Dealers, Central Stations and other electrical industry outlets appears regularly in each issue of ELECTRICAL RECORD as heretofore.

ALLOYS, LIGHT METAL
Bohn Aluminum & Brass Corp., Detroit, Mich.
Bohnalite. See Bohn Aluminum & Brass Corp.

ALUMINUM
(Also Aluminum Bronze Powder.)
Albron, Alcoa, Alumac. See Aluminum Co. of America.
Aluminum Co. of America, 2444 Oliver Bldg., Pittsburgh.

AMMETERS. See Instruments.

ARMATURE
Balancers. See Balancers, Armature.
Banding Machines. See Banding Machines, Armature
Bearings. See Bearings.
Buggies. See Lifts, Armature.
Coil Presses. See Presses, Armature Coil
Coils. See Coils, Finished.
Core Punchings. See Discs, Armature.
Cranes. See Lifts, Armature.
Discs. See Discs, Armature.
Driers. See Ovens.
Growlers. See Testers, Coil.
Hoists. See Lifts, Armature.
Impregnators, Vacuum. See Ovens, Industrial
Jacks. See Lifts, Armature.
Laminations. See Discs, Armature.
Lathes. See Lathes.
Lifts. See Lifts, Armature
New. See Coils, Finished
Notching Machines. See Notching Machines, Armature.
Pegs. See Pegs, Armature.
Pinion Pullers. See Pullers, Armature Shaft.
Repaired. See Repairing and Second-Hand.
Shaft Pullers. See Pullers, Armature Shaft.
Shaft Straighteners. See Straighteners, Armature Shaft.
Stands. See Stands, Armature.
Test Benches. See Test Benches, Armature.
Testers. See Testers, Coil; also Test Benches, Armature.
Torpedo Cord. See Twine, Armature Winding.
Trouble Shooters. See Testers, Coil; also Test Benches, Armature.
Trucks. See Lifts, Armature.
Wedges. See Pegs, Armature.
Winding Machines. See Winding Machines, Armature & Field Coil.
Winding Twine. See Twine, Armature.

ARMATURE & COIL SPRAY GUNS. See Spraying Outfits.

ARMORING MACHINES. See Wire Manufacturing Machines.

ARMS, FLEXIBLE. See Tubing Flexible Metallic.

ASBESTOS Shades. See Shades, Fabric.
Paper & Sheet. See Asbestos.
Slabs. See Asbestos Slabs.
Tape. See Tape, Asbestos.
Wire. See Wire, Insulated.
Yarn and Thread. See Yarn and Thread.

ASBESTOS
Sheet, Paper, Mill Board, Lumber.
Ambler Asbestos Shingle & Sheathing Co., Ambler, Pa.
Asbeston. See Eastern Asbestos Co.
Eastern Asbestos Co., Providence, R. I.
Ferodo & Asbestos, Inc., New Brunswick, N. J.
Johns-Manville Corp., New York, N. Y.

ASBESTOS SLABS
Slabs & Barriers for Switchboard.
Asbestos-Ebony. See Johns-Manville, Inc
Ambler Asbestos Shingle & Sheathing Co., Ambler, Pa.
Deceleco, Inc., Wayne, Mich.
Ferodo & Asbestos, Inc., New Brunswick, N. J.
Johns-Manville Corp., New York, N. Y.
Transite. See Johns-Manville, Inc
Zallite. See Deceleco, Inc.

BAGS, Vacuum Cleaner
Merrimack Mfg. Co., Boston, Mass.

BAKELITE MOULDS. See Dies, Die Makers.

BALANCERS, Armature
(Dynamic Balancing Machines—Balancing Ways).
Anderson Bros. Mfg. Co., Rockford, Ill. (Ways).
Armature Coil Equip. Co., 2415 Forestdale Ave., Cleveland, O. (Machine).
Bowsher Co., N. P., South Bend, Ind.
Cisco Testing Machine Co., Tinius, 500 N. 12th St., Philadelphia, Pa. (Machines)
Sundstrand Machine Tool Co., Rockford, Ill.
Twentieth Century. See Sundstrand Machine Tool Co.
Vibration Specialty Co., 1534 Winter, Philadelphia, Pa. (Machines).

BALL BEARINGS. See Bearings, Ball and Roller

BANDING MACHINES, Armature
Columbia Machine Wks. & Malleable Iron Co., Atlantic Ave. & Chestnut St., Brooklyn, N. Y.
Electric Service Supplies Co., 17th & Cambria Sts., Philadelphia, Pa.
Peerless. See Electric Service Supplies Co.
Ridion Company, Frank, Boston, Mass.

BARRIERS, Switchboard. See Slate; also Soapstone; also Asbestos.

BARS, BUS. See Brass, Bronze & Copper; also Aluminum.

BARS, Commutator
Anaconda. See American Brass Co.
American Brass Co., Waterbury, Conn.
Buckeye Tempered Copper & Brass Co., Mansfield, O.
Cameron Electric Mfg. Co., Ansonia, Conn.
Commutator Co., 121 N. Front, Minneapolis, Minn.
Electric Materials Co., North East, Pa.
Eureka Metal Products Corp., 91 Clay, North East, Pa
Homer Commutator Co., 4748 Hough Ave., N. E., Cleveland
Rome Brass & Copper Co., Rome, N. Y.

BASES, Radio Tube. See Radio Mahled Parts.

BASES, Reading Lamp
Metal, Pottery, Wood & Glass.
American Ring Co., Waterbury, Conn.
Aladdin Mfg. Co., Muncie, Ind.
Armor Bronze Co., Garwood, N. J.
Camden Art Tile & Pottery Co., Camden, Ark.
Colonial. See Old Colony Iron Wks.
Estes & Sons, E. B., 5844 Grand Central Terminal, New
Fulper Pottery Co., Flemington, N. J.
Globe Metal Spinning Co., 178 Centre, New York, N. Y.
Hemill Products, Inc., 103 Mott, New York, N. Y.
Insulation Mfg. Co., New York Ave. and Herkimer St., Brooklyn, N. Y.
Marbleart. See Insulation Mfg. Co.
Natural. See Insulation Mfg. Co.
Old Colony Iron Wks., Bridgeport, Conn.
Rodale Mfg. Co., 200 Hudson, New York, N. Y.
Sneath Glass Co., Hartford City, Ind.
Van Briggle Tile & Pottery Co., Colorado Springs, Colo.
Weller, S. A., Zanesville, O. (Pottery.)
Yokel Corp., 219 Homestead Ave., Hartford, Conn.
Zane Pottery Co., South Zanesville, O.

BATTERY CHEMICALS. See Chemicals, Battery.

BATTERY CUT OUTS. See Switches, Battery.

BATTERY GAGES. See Instruments, Pocket.

BATTERY JARS. See Jars, Battery, Glass; also Rubber; also Molded Insulation.

BATTERY OXIDES. See Chemicals, Battery.

BATTERY SALTS. See Chemicals, Battery.

BEAD CHAIN. See Chain, Socket.

BEADS, Chandelier. See Crystals, Chandelier.

BEADS, Insulating
American Lava Corp., 1425 William, Chattanooga, Tenn.
Durco. See Struthers Dunn, Inc.
Martindale Elec. Co., 1262 W. Fourth, Cleveland, O.
Struthers Dunn, Inc., 1135 Race, Philadelphia, Pa.
Stupakoff Laboratories, 6627 Hamilton Ave., Pittsburgh, Pa.

BEARINGS
Ball & Roller. See Bearings, Ball & Roller.
Graphite. See Bearings, Oil-less.
Oil-less. See Bearings, Oil-less.
Sleeve. See Bearings & Bushings.

BEARINGS, Ball and Roller
Ahlberg Bearing Co., 312 E. 29th, Chicago, Ill.
Auburn Ball Bearings Co., 73 Clarissa, Rochester, N. Y.
Bantam Ball Bearing Co., South Bend, Ind.
Bearings Co. of America, Lancaster, Pa.
Commercial. See Schatz Mfg. Co.
C J B. See Ahlberg Bearing Co.
Fafnir Bearing Co., New Britain, Conn.
Federal Bearing Co., Poughkeepsie, N. Y.
Gurney. See Marlin-Rockwell Corp.
Hyatt Roller Bearing Co., Newark, N. J.
Hoffman. See Norma-Hoffman Bearings Corp.
McGill Metal Co., Valparaiso, Ind.
Marlin-Rockwell Corp., Jamestown, N. Y.
Mathews Mfg. Co., 104 Gold, Worcester, Mass.
New Departure Mfg. Co., Bristol, Conn.
Nice Ball Bearing Co. (Nicetown), Philadelphia, Pa.
Norma-Hoffman Bearings Corp., Stamford, Conn.
Roller Bearing Co. of America, Whitehead Rd., Trenton,
Schatz Mfg. Co., Poughkeepsie, N. Y.
Schubert. See McGill Metal Co.
Standard Steel & Bearings, Inc., Plainville, Conn.
Strom Bearings Co., 4587 Palmer, Chicago, Ill.
S. K. F. Industries, 40 E. 34th, New York, N. Y.
Timken Roller Bearing Co., Canton, O.
Torrington Co., Torrington, Conn.

BEARINGS, Oil-Less
Argute Oilless Bearings Co., 149 Berkeley, Philadelphia, Pa.
B. M. C. See Burlington Metal Corp.
Bogert & Hopper, Inc., 225 Varick, New York, N. Y.
Bound Brook Oil-less Bearing Co., Bound Brook, N. J.
Burlington Metal Corp., Burlington, Wis.
Cleveland Graphite Bronze Co., 880 E. 72nd, Cleveland, O.
Electric Railway Equipment Co., 30 Church, New York, N. Y.
Elreco. See Electric Railway Equipment Co.
Graphalloy. See Graphite Metallizing Co.
Graphite Metallizing Co., Yonkers, N. Y.
Lubrite. See Merriam Bros., Yonkers, N. Y.
Merriam Bros., 185 Amory, Boston, Mass.
Metal Saw & Machine Co., Springfield, Mass.
Moraine Products Co., First & Foundry Sts., Dayton, O.
Neveroil Bearing Co., Wakefield, Mass.
Nolu Oilless Bearing Co., 6 E. Johnson, Philadelphia, Pa.
O. & S. Bearing Co., 315 E. Artillery, Detroit, Mich.
Reliance. See Metal Saw & Machine Co.
Selb Lignum-Vitae Woodturning Co., 98 Boyd Ave., Jersey City, N. J.
United States Graphite Bearing Co., Saginaw, Mich

BEARINGS AND BUSHINGS
(For Armature Shafts.)
Adjustable Bearing Co., 101 Transportation Bldg., Indianapolis, Ind.
Ajax Metal Co., Philadelphia, Pa.
American Bronze Corp., Berwyn, Pa.
Bohn Aluminum & Brass Corp., Detroit, Mich.
Bunting Brass & Bronze Co., Toledo, Ohio
Damascus Bronze Co., Pittsburgh, Pa.
Durex. See Moraine Products Co.
Federal-Mogul Corp., Shoemaker & Lillibridge Sts., Detroit,
Flood City Mfg. Co., Johnstown, Pa.
Johnson Bronze Co., New Castle, Pa.
Lumen Bearing Co., Buffalo, N. Y.
Moraine Products Co., First & Foundry Sts., Dayton, O.
National Bearing Metal Corp. (More-Jones Brass & Metal Div.), 4930 Manchester Ave., St. Louis, Mo.
United States Graphite Co., Saginaw, Mich.

BELTING, Chain Transmission. See Chain, Power Transmission.

BELTS, Rubber
Molded Cord Rubber Belts for Electrical Appliances
Fay Rubber Products Co., Elyria, O.
Gilmer Co., L. H., Cottman & Keystone Sts. (Tacony), Philadelphia, Pa.

BENDERS, Coil Loop
Armature Coil Equipment Co., 2415 Forestdale Ave., Cleveland, Ohio.
Electric Service Supplies Co., 17th & Cambria Sts., Philadelphia, Pa.
Segur. See Electric Service Supplies Co.

BENDING. See Punching & Bending.

BINDING POSTS. See Posts, Binding.

BLADES, Fan
Estes & Sons, E. B., 5844 Grand Central Terminal Bldg. New York, N. Y.
Spee-Dee Elec. Mfg. Co., 199 Lafayette, New York, N. Y
Torrington Mfg. Co., Torrington, Conn.

BLUESTONE. See Chemicals, Battery.

BOARD, Fuller. See Cloth and Paper.

BOARD, Press. See Cloth and Paper.

BOMBARDING MACHINES. See Machines, Lamp Making.

BOWL HOLDERS. See Fixture Fittings.

BOX & CABINET BUSHINGS. See Bushings, Box & Cabinet.

BOX BOARD
Container Corp. of America, 111 W. Washington, Chicago
Mid-West Box Co., 111 W. Washington, Chicago.

BOXES, Fibre
Container Corp. of America, 111 W. Washington, Chicago
Corrfibre. See Container Corp. of America.
Mid-West Box Co., 111 W. Washington, Chicago.

BOXES, Sheet Steel. See Cabinets, Sheet Steel.

BOXES, Wood. See Cabinets & Boxes, Wood.

BOXES AND WRAPPERS
Agar Mfg. Corp., Whippany, N. J.
Brown & Bailey Co., 417 N. Eighth, Philadelphia, Pa.
Bulldog. See Pittsburgh Corrugated Paper Box Co.
Campbell Paper Box Co., South Bend, Ind
Consolidated Paper Co., Monroe, Mich.
Container Corp. of America, 111 W. Washington, Chicago
Gair Co., Robert, 429 Lexington Ave., New York. (Boxes)
Gator-Hide Kraft. See International Paper Co.
Hinde & Dauch Paper Co., 304 Decatur, Sandusky, Ohio.
Huntington Paper Box Co., Huntington, Ind.
International Paper Co., 100 E. 42nd, New York, N. Y
Lake Lithographing Co., 2570 Superior Ave., Cleveland, O (Display Cartons.)
Mid-West Box Co., 111 W. Washington, Dept. 36, Chicago
National Folding Box Co., New Haven, Conn. (Cartons.)
Pequot Mfg. Corp., Glendale (L. I.), New York.
Pittsburgh Corrugated Paper Box Co., Pittsburgh, Pa.
River Raisin Paper Co., Monroe, Mich.
Rockford Fibre Container Co., Rockford, Ill.
Sefton Mfg. Co., 59 E. Madison, Chicago, Ill.
Shuttleworth Carton Co., 474 W. Broadway, New York.

BRACKETS, Instrument
For Suspending Meters to Station Switchboard.
General Electric Co., Schenectady, N. Y.
Roller-Smith Co., 239 Broadway, New York, N. Y.
Trumbull Elec. Mfg. Co., Plainville, Conn.
Westinghouse Elec. & Mfg. Co., E. Pittsburgh, Pa.

BRAIDING MACHINES. See Wire Manufacturing Machines.

BRASS TUBING. See Tubing, Brass and Copper.

BRASS, BRONZE AND COPPER
Sheet, Rod, Bar.
Anaconda. See American Brass Co.
American Brass Co., Waterbury, Conn.
American Nickeloid Co., Peru, Ind.
Baltimore Brass Co., 1212 Wicomico, Baltimore, Md.
Baltimore Copper Mills, (Div. of General Cable Corp.) Baltimore, Md.
Bohn Aluminum & Brass Corp., Detroit, Mich.
Bohnalite. See Bohn Aluminum & Brass Corp.
Bridgeport Brass Co., 774 E. Main, Bridgeport, Conn.
Buffalo Bronze Die Cast Corp., 100 Arthur, Buffalo, N. Y
Dallas Brass & Copper Co., 820 Orleans, Chicago, Ill.
Durbar. See Buffalo Bronze Die Cast Corp.
Electric Materials Co., North East, Pa.
Federal-Mogul Corp., Shoemaker & Lillibridge Sts., Detroit
Higgins Brass & Mfg. Co., 12435 Dequindre, Detroit, Mich.
Johnson Bronze Co., New Castle, Pa.
Michigan Copper & Brass Co., 5851 W. Jefferson Ave., Detroit, Mich.
Nickeloid. See American Nickeloid Co.
Plume & Atwood Mfg. Co., 474 Bank, Waterbury, Conn.
Scovill Mfg. Co., Waterbury, Conn.
Seymour Mfg. Co., Seymour, Conn.
Taunton-New Bedford Copper Co., Taunton, Mass.
Titan Metal Mfg. Co., Bellefonte, Pa. (Rods and Forgings.)
Western Cartridge Co., East Alton, Ill.

BREAKERS, Circuit. See Circuit Breakers.

BRIDGES, Wheatstone. See Instruments, Laboratory Standard

BRONZE. See Brass, Bronze and Copper; also Castings

BRONZE, Phosphor. See Phosphor Bronze.

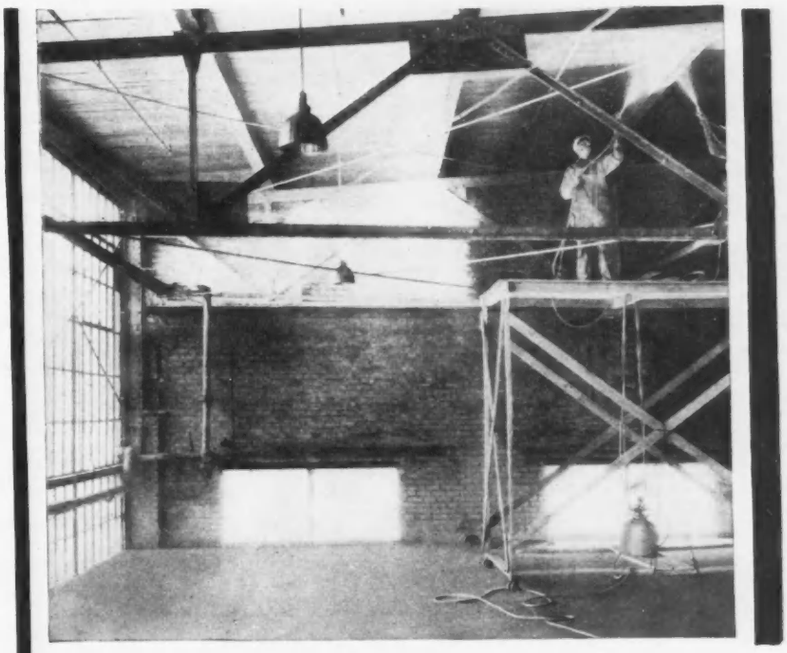
BRONZE POWDER, Aluminum. See Aluminum

BRUSH HOLDERS. See Brushes, Commutator

BRUSHES, Carbon. See Brushes, Commutator
Graphite. See Brushes, Commutator.
Metal Graphite. See Brushes, Commutator.

BRUSHES, COMMUTATOR
(Brushes, Brush Holders and Flexible Leads.)
Brush Holders ..... See H
Carbon, Graphite, Metal Graphite ..... See C
Flexible Leads and Pig Tails ..... See L
Sheet Metal ..... See S
Wire Gauze ..... See W
Automotive Mfg. Co., Kansas City, Mo. ..... H
B. B. B. See Becker Bros. Elec'l Corp.

NOTICE HOW ALUMINUM PAINT *transforms this interior*



Spray painting the interior of the Wayne Company plant at Fort Wayne, Ind., with Aluminum Paint.

THE walls and ceiling of the left section of the room shown above have already received their coat of Aluminum Paint. There are no dark corners here. Note the fine working light—and the contrast between the visibility in the painted and the unpainted areas.

Just one coat of Aluminum Paint makes all this difference—and in addition affords durable and lasting protection to the surfaces it covers.

Aluminum Paint is receiving a wide acceptance as a covering for industrial interiors. Its metallic film—formed by the unique property of "leafing," is slow to discolor and may be washed down almost like tile.

Note also the ease of Aluminum Paint's application. It spreads further and lasts longer than ordinary paints—and costs no more.

Send for a copy of the booklet, "Aluminum Paint." It's a true story of practical, economical plant maintenance.

ALUMINUM PAINT
"IT LEAFS"

ALUMINUM COMPANY OF AMERICA
2444 Oliver Bldg., Pittsburgh, Pa.
Offices in 19 Principal American Cities

ALBRON
ALUMINUM

The pigment base for the better grades of Aluminum Paint is Albron—made from pure ALCOA Aluminum.

BRUSHES, Commutator—Continued
Baylis Co., Bloomfield, N. J. H
Becker Bros. Elec. Corp., 23 N. Jefferson, Chicago, Ill. C W S H L
Blanck & Carrier Corp., 115 W. 63rd, New York, N. Y. C
Boxill-Bruel Carbon Co., Columbia Park, O. C H
Calebaugh Self-Lubricating Carbon Co., 1503 Columbia Ave., Philadelphia, Pa. C L
Carbon Engrg. Co., Slinger, Wis. C L
Carbon Laboratories Co., 5005 Euclid Ave., Cleveland, O. C
Carbon & Graphite Corp., 227 Broadway, New York, N. Y. C
Carenco. See Carbon Engineering Co.
Chapin Co., Chas. E., 227 Fulton St., New York, N. Y. C W S L
Columbia Machine Wks. & M. I. Co., 263 Chestnut, Brooklyn, N. Y. H
Cooley Mfg. Co., 98 Park Place, New York W
Diamond C. See Chapin Co., Chas. E.
Dixon Crucible Co., Joseph, Jersey City
Electra. See Automotive Mfg. Co.
Electric Accessories Co., 310 York Ave., Philadelphia, Pa. H
Electro-Nite Carbon Co., 308 N. Fourth., Philadelphia, Pa.
Eureka Metal Products Corp., 91 Clay, North East, Pa. W S H
Fleck Carbon Co., 508 Broome, New York
General Electric Co., Schenectady, N. Y. C H
Graphalloy. See Graphite Metallizing Corp.
Graphite Metallizing Corp., 1040 Nepperhan Ave., Yonkers, N. Y. C H
Henrite Products Co., 98 Park Place, New York, N. Y. C
Holland Trolley Supply Co., 1623 E. 43rd, Cleveland, Ohio H
Jeandron, W. J., 345 Madison Ave., New York, N. Y. (Imported.) C
Keystone Carbon Co., 4630 N. 11th, Philadelphia, Pa. C
Kohlenite Products Co., 92-34 152nd St., Jamaica, N. Y. C
Le Carbone. See Jeandron, W. J.
Le Valley Vitae Carbon Brush Co., 4851 Grand Central Terminal, New York, N. Y. C
Marks Elec. Co., Hiram, 304 Woodward Ave., Detroit, Mich. C
Morganite Brush Co., 33-02 48th Ave., Long Island City, N. Y. C
National Carbon Co., Cleveland, O. C
New Process Carbon Co., 1503 Columbia Ave., Philadelphia, Pa. C L
No Spark. See Calebaugh Self-Lubricating.
Ohio Carbon Co., 8215 Almira Ave., Cleveland, Ohio C W L
Ohio Elec. Specialty Mfg. Co., Troy, O. W
Perfection Supply Co., 98 Park Pl., New York, N. Y. C W S H L
Pittsburgh Carbon Brush Co., 127 Fancourt, Pittsburgh, Pa. C
Pure Carbon Co., Wellsville, N. Y. C W S L
Pyramid. See National Carbon Co.
Reaction. See Baylis Co.
Rome Wire Co., Div. of General Cable Corp., Rome, N. Y. W L
Salem Electrical Supply Co., Salem, Mass. W
Snarr & Co., Geo. W., 110 S. Ninth, St. Louis, Mo. C
Spee-Dee Elec. Mfg. Co., 199 Lafayette, New York, N. Y. C L
Speer Carbon Co., St. Mary's, Pa. C
Stackpole Carbon Co., St. Mary's, Pa. C
Sterling. See Carbon Laboratories Co.
Superior Carbon Products Co., North Rd., Poughkeepsie, N. Y. C
U. S. Graphite Co., Saginaw, Mich. C
Universal. See Graphite Metallizing Corp.
Weber Elec. Wks., Brooklyn Sta., Cleveland. C L

BRUSHES, PNEUMATIC SPRAYING. See Spraying Outfits.

BRUSHES FOR VACUUM CLEANERS

Omaha Brush Co., 320 N. 15th, Omaha, Neb. (Brushes rebristled.)
Osborn Mfg. Co., 5401 Hamilton Ave., Cleveland, Ohio.

BUGGIES. Armature. See Lifts, Armature.

BULBS, Glass

For Incandescent Lamps and Tubes.
Almo Mfg. Co., 38 Crawford, Newark, N. J.
Corning Glass Wks., Corning, N. Y.
Fayette Glass Bulb Co., 229 21st, Brooklyn, N. Y.
Libby Glass Co., Toledo, O.

BUNCHING MACHINES. See Wire Manufacturing Machines.

BUSHINGS, SHAFT. See Bearings and Bushings.

BUSHINGS, Box and Cabinet, Porcelain

Appleton Electric Co., 1704 Wellington Ave., Chicago, Ill.
Columbia Metal Box Co., 226 E. 144th St., New York, N. Y.
Harter. See Multi Elecl. Mfg. Co.
Knox Porcelain Corp., Knoxville, Tenn.
Mineral lac Electric Co., 25 N. Peoria, Chicago, Ill.
Multi Electric Mfg. Co., 210 N. Ogden Ave., Chicago, Ill.
Nelson Elec. Co., Plant City, Fla.

CABINET GRILL CLOTH. See Cloth, Untreated.

CABINETS, Fibre

Continental-Diamond Fibre Co., Bridgeport, Pa.
Vulcawood. See Continental-Diamond Fibre Co.

CABINETS. Refrigerator. See Refrigerator Cabinets.

CABINETS, Sheet Steel

Stamped and Turned-up Boxes and Cabinets.
Acme Blow Pipe & Sheet Metal Wks., New Orleans, La.
Adam Electric Co., Frank, St. Louis, Mo.

All-Steel-Equip. Co., Aurora, Ill.
American Metal Wks., 4868 Stanton Ave., Philadelphia, Pa.
American Steel Furniture Co., 27 W. 24th, New York, N. Y.
Aurora Steel Products Co., Aurora, Ill.
Benjamin Elec. Co., 1378 E. 16th, Los Angeles, Cal.
Berks Engineering Co., Reading, Pa.
Berthold Elec. Co., Gus, 551 W. Monroe, Chicago, Ill.
Bonnell Elec. Mfg. Co., 192 Chambers, New York, N. Y.
Chicago Hdwe. Foundry Co., North Chicago, Ill.
C. & P. Electric Wks., Springfield, Mass.
Cleveland Switchboard Co., 2915 E. 79th, Cleveland, O.
Coast Specialty Co., 73 E. Sixth, Portland, Ore.
Cole Metal Products Co., 33 Crescent, Long Island City.
Colt's Patent Fire Arms Mfg. Co., Hartford, Conn.
Columbia Elec. Mfg. Co., 59 Columbus Sq., San Francisco, Cal.
Columbia Metal Box Co., 226 E. 144th, New York, N. Y.
Columbian Steel Tank Co., 1505 W. 12th, Kansas City, Mo.
Commercial Mfg. & Supply Co., 1443 Delaware St., Denver.
Creiger Electrical Mfg. Co., 609 W. Lake, Chicago, Ill.
Diamond Elec'l Mfg. Co., 1330 E. 16th, Los Angeles, Cal.
Dowman-Dozier Mfg. Co., 1314 Murphy Ave., S. W., Atlanta, Ga.
Electric Apparatus Co., 704 N. Halsted, Chicago, Ill.
Electric Panelboard Co., 426 Exchange, Rochester, N. Y.
Federal Steel Products Co., 2 Ave. L, Newark, N. J. (Polarized Boxes.)
Fouch Elec. Mfg. Co., 105 N. Ninth, Portland, Ore.
Greater New York Metal Box Co., Inc., 143 W. 19th, New York.
Green Elec. Co., 31 N. Water, Rochester, N. Y.
Gurney Sheet Metal Wks., 718 E. 4th, Long Beach, Cal.
Hauer, J. B., Driggs Ave. and N. 11th, Brooklyn, N. Y.
Holzer Sheet Metal Wks., Inc., New Orleans, La.
Hough Mfg. Co., 2520 24th, Detroit, Mich.
Isert Co., J. H., 1234 Rowan, Louisville, Ky.
Karp Metal Products Co., 129 30th, Brooklyn, N. Y.
Kirtland Elec. Construction Co., 34 Herkimer, Albany, N. Y.
Large-Dail Mfg. Co., 406 Cherry St., Philadelphia.
Leonard Elec. Mfg. Co., 2907 Perkins Ave., Cleveland, O.
Lexington Elec. Products Co., 419 E. 24th, New York, N. Y.
Lorentzen, H. K., 155 Leonard, New York, N. Y.
MacMillen Mfg. Co., 1400 N. Spring, Los Angeles, Cal.
Mansfield Elec. Hardware Co., Longview Ave., Mansfield, O.
Metropolitan Elec. Co., 2914 First Ave., S., Seattle, Wash.
Metropolitan Elec. Products Co., Blvd. at 14th, Long Island City, N. Y.
Milwaukee Vault & Cabinet Co., 521 Market, Milwaukee.
Mosher, S. L., 1951 Lawrence, Denver, Colo.
National Metal Box Co., Van Dyke & Ferris Sts., Brooklyn.
Newman Elec. & Mfg. Co., Eau Claire, Wis.
Par-Metal Products Corp., 3519 41st, Long Island City, N. Y.
Penn Electrical Co., 35 Water, Irwin, Pa.
Powerlite Switchboard Co., 4149 E. 79th, Cleveland, O.
Rezioh. See Holzer Sheet Metal Works.
Robbins & Myers, Inc., Springfield, O.
Security. See Aurora Steel Products Co.
Standard Metal Box Corp., 933 Grand St., Brooklyn, N. Y.
Star Metal Box Co., 228 46th, Brooklyn, N. Y.
Superior Switchboard & Devices Co., 420 Schroyer Ave., Canton, O.
Tanner & Co., Wm. F., 511 S. Sharp, Baltimore, Md.
United Metal Box Co., 473 President, Brooklyn, N. Y.
United Sheet Metal Wks., 575 Howard, San Francisco.
Universal Metal Box & Products Co., 316 Colt, Irvington, N. J.
Wadsworth Elec. Mfg. Co., Covington, Ky.
Wiegman & Co., E. M., 1908 Benton, St. Louis, Mo.
Wurdack Elec. Mfg. Co., 4444 Clayton Ave., St. Louis, Mo.

CABINETS AND BOXES, Wood

Accurate Molding Corp., 20 Morton, Brooklyn, N. Y.
Adler Mfg. Co., Louisville, Ky.
Adler Royal. See Adler Mfg. Co.
Ampere. See Donehue Lumber Co.
Art Woodworking Co., Inc., 1035 Seattle Blvd., Seattle, Wash.
Aston Cabinet Mfrs., 1223 W. Lake, Chicago, Ill.
Blackhawk Furniture Co., Rockford, Ill.
Boehm Cabinet Co., J., 2216 W. 63rd St., Cleveland, O.
Carlon. See Art Woodworking Co.
Carolina Wood Products Co., Asheville, N. C.
Carron Co., Ludington, Mich.
Caswell-Runyon Co., Huntington, Ind.
Cheney Piano Action Co., A. C., Castleton, N. Y.
Chickasaw Furniture Mfg. Co., Memphis, Tenn.
Conrades Mfg. Co., 1942 N. Second, St. Louis, Mo.
Conner Furniture Co., New Albany, Ind.
Corbett Cabinet Mfg. Co., St. Mary's, Pa.
Cory Cabinet Corp., Springfield, Mo.
Dederer Co., Geo., Henderson, Ky.
Ebert Furniture Co., 225 W. 34th, New York, N. Y.
Effein & Sons, Frederick, 44 Central Ave., Brooklyn, N. Y.
Empire-United Hat Block Co., 312 E. 22nd, New York.
Estes & Sons, E. B., 5844 Grand Central Terminal Bldg., New York, N. Y.
Excel Phonograph Mfg. Co., 400 W. Erie, Chicago, Ill.
Excello Products Corp., 4836 W. 16th, Cicero, Ill.
Federal Wood Products Corp., 206 Lexington Ave., New York, N. Y.
Findlay Mfg. Co., Metropolitan & Morgan Aves., Brooklyn.
Grand Rapids Furniture Co., Grand Rapids, Mich.
Harper Mfg. Co., Cassopolis, Mich.
Hickory Box Co., Hickory, N. C.
Hubbell, H. L., 59 Market Ave., N. W., Grand Rapids.
Interstate Woodworking Co., 46 Wooster, New York, N. Y.
Karpen. See Studner Bros.
Kiel Furniture Co., 32nd and Center Sts., Milwaukee, Wis (Radio Table).
King Mfg. Corp., 254 Rano, Buffalo, N. Y.
Klumpp Sons, John G., 13 Baxter, New York, N. Y.
Knoxville Table & Chair Co., Knoxville, Tenn.
National Cabinet Co., New Philadelphia, O.
New England Box Co., Greenfield, Mass.
Ohio Valley Cabinet Co., Wheeling (Warwood), W. Va.
Oneida Cabinet Corp., Oneida, N. Y.
Ottawa Furniture Co., Holland, Mich.
Pooley Co., 16th & Indiana Ave., Philadelphia, Pa.
Radio Allied Mfrs. Corp., 1340 S. Michigan Ave., Chicago.

Radio Cabinet Mfg. Corp., Furniture Mart, Chicago, Ill.
Radio Cabinet & Equipment Co., 1504 Vine, Philadelphia.
Radio Mfg. Co., Div. of Pilliod Lumber Co., Swanton, O.
Radio Master Corp., Bay City, Mich.
Red Lion Cabinet Co., Red Lion, Pa.
R. E. Z. Cabinet Co., 54 North, Boston, Mass.
Schutz Bros., 152 Chambers, New York, N. Y.
Showers Bros. Co., Bloomington, Ind.
Signal Elec. Mfg. Co., Menominee, Mich.
Southern Toy Co., Hickory, N. C.
Specialty Display Case Co., Kendallville, Ind.
Starr Piano Co., Richmond, Ind.
Stettner Phonograph Corp., 629 Kent Ave., Brooklyn, N. Y.
Studner Bros., 67 W. 44th, New York, N. Y.
Superior Cabinet Corp., 206 Broadway, New York, N. Y.
Syracuse Screen & Grille Co., North Manchester, Ind.
Tessier Bros., 355 Bridge, Northampton, Mass. (Radio.)
Trenton Wood Specialty Co., Stokes Ave. and P. R. R., Trenton, N. J.
Udell Wks., 28th and Barnes Ave., Indianapolis, Ind.
United Reproducers Corp., 25 Leighton Ave., Rochester, N. Y.
West Box Co., 235 Liberty, Springfield, Mass.
Wood Cabinet Corp., 196 Lexington Ave., New York., N. Y.

CABLE ARMORING MACHINES. See Wire Manufacturing Machines.

CABLE TEST SETS. See Instruments, Portable and Switchboard.

CABLING MACHINES. See Wire Manufacturing Machines.

CANDLES, Fixture

Glass, Fibre Paper.
Brandywine Fibre Products Co., 1402 Walnut, Wilmington.
Cleveland Container Co., 10800 Berea Rd., Cleveland, O.
Fibro Products Co., New Bedford, Mass.
Franklin Fibre Specialty Co., 173 Lafayette, New York, N.Y.
Phoenix Glass Co., Monaca, Pa.
Remington Mfg. Co., 939 Barnum Ave., Bridgeport, Conn.
Seamless. See Fibro Products Co.

CANOPY (Canopies). See Fixture Fittings.
Insulators. See Insulators.
Switches. See Switches, Snap.

CAPACITORS, RADIO. See Radio Circuit Components.

CARBON, Powdered

Marks Elec. Co., Hiram, 304 Woodward Ave., Detroit, Mich.

CARBONS, Battery. See Cartons.
Arc Light. See Carbons.

CARBONS

Battery Arc Light.
Becker Bros. Elecl. Corp., 23 N. Jefferson, Chicago, Ill.
Blanck & Carrier Corp., 115 W. 63rd, New York, N. Y.
Columbia. See National Carbon Co.
Daylight. See National Carbon Co.
Lessing Battery. See Blanck & Carrier Corp.
Nuernberg Battery. See Blanck & Carrier Corp.
National Carbon Co., Cleveland, Ohio.
Oretip. See National Carbon Co.
Silvertip. See National Carbon Co.
Speer Carbon Co., St. Mary's, Pa.
Stackpole Carbon Co., St. Mary's, Pa.

CARTONS. See Boxes and Wrappers.

CASEIN PLASTICS. See Molded Insulation.

CASES, Eliminator. See Cases, Eliminator.
Flashlight. See Cases, Flashlight.

CASES, Eliminator

Brumberger Co., 252 Pearl, New York, N. Y.
Grand Sheet Metal Wks., 176 Grand, New York, N. Y.
Karp Metal Products Co., 129 30th, Brooklyn.

CASES, Flashlight

Bridgeport Brass Co., 744 E. Main, Bridgeport, Conn.
Lincoln Fibre Specialty Co., Newport, Del.
St. Louis Paper Can & Tube Co., St. Louis, Mo.
Underwood Battery Co., 1250 Ontario, Cleveland, O.

CASTINGS, Aluminum. See Castings, Aluminum. Also
Castings, Copper, etc.
Brass. See Castings.
Bronze. See Castings.
Copper. See Castings.
Die. See Castings, Die.
Monel Metal. See Castings.
Steel. See Castings, Steel.
White Metal. See Castings.

CASTINGS, Aluminum

Aluminum Co. of America, 2471 Oliver Bldg., Pittsburgh.
Bergen Point Brass Foundry, Bayonne, N. J.
Berks Foundry & Mfg. Co., West Hamberg, Pa.
Bohm Aluminum & Brass Corp., Detroit, Mich.
Bonnell Elec. Mfg. Co., 192 Chambers, New York, N. Y.
Dick Bros., Inc., Reading, Pa.
Eureka Metal Products Corp., 91 Clay, North East, Pa.
Monarch Aluminum Ware Co., 9301 Detroit Ave., Cleveland.
National Bronze & Aluminum Foundry Co., 88th & Lexington, Cleveland, O.
Quality Aluminum Casting Co., Waukesha, Wis.
Tenual. See National Bronze & Aluminum Foundry Co.
United Metal Mfg. Co., Inc., 25 Shipping, Norwich, Conn.
Veco Mfg. Co., South Norwalk, Conn.

CASTINGS

Copper, Brass, Bronze, Monel Metal, White Metal.
Anderson Mfg. Co., Albert & J. M., 289 A, Boston, Mass.
Bergen Point Brass Foundry, Bayonne, N. J.
Berks Foundry & Mfg. Co., West Hamberg, Pa.
Bohn Aluminum & Brass Corp., Detroit.
Bonnell Elec. Mfg. Co., 192 Chambers, New York, N. Y.
Bridgeport Castings Co., 250 North Ave., Bridgeport, Conn.
Central Pattern & Foundry Co., 3737 S. Sacramento Ave., Chicago, Ill.
Chase Brass & Copper Co., Waterbury, Conn.
Chicago Hardware Foundry Co., North Chicago, Ill.
Davis & Zuckerman, 514 E. 11th, New York, N. Y.
Delta Star Electric Co., 2437 Fulton, Chicago, Ill.
Dick Bros., Inc., Reading, Pa.
Eureka Metal Products Corp., 91 Clay, North East, Pa.
Faries Mfg. Co., Decatur, Ill.
Federal-Mogul Corp., Shoemaker & Lillibridge Sts., Detroit.
Harsch, John, Bronze & Foundry Co., 11612 Madison Ave., Cleveland, O.
Johnson Bronze Co., New Castle, Pa.

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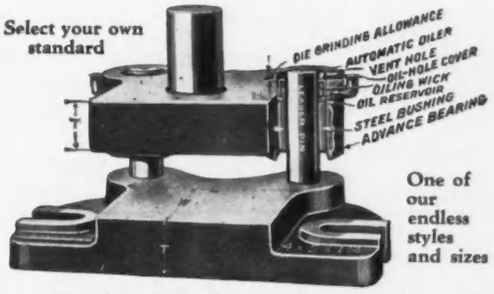

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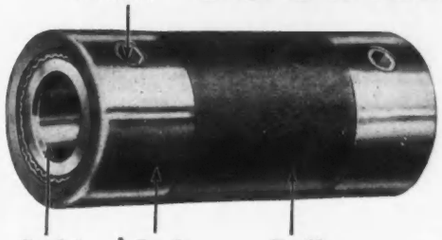

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Talmage and 33rd Aves., S. E.
MINNEAPOLIS, MINN.

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McGill Metal Co., Valparaiso, Ind.
National Bronze & Aluminum Foundry Co., 88th & Lazy, Cleveland, O.
Ohio Pattern Wks. & Fdy. Co., 2739 Spring Grove Ave., Cincinnati, O.
Rabun Bronze Foundry, 617 West Belgrave, Huntington Park, Cal.
Sterling Art Metal Wks., 40 Purvis, Long Island City, N. Y.
Tenual. See National Bronze & Aluminum Foundry Co.
United Metal Mfg. Co., Inc., 25 Shipping, Norwich, Conn

CASTINGS, Die

Advance Tool & Die Casting Co., 1654 Holton, Milwaukee, Wis.
Alemite Die-Casting & Mfg. Co., 2640 Belmont Ave., Chicago, Ill.
Allied Die-Casting Corp., Long Island City, N. Y.
Alumac. See Aluminum Co. of America.
Aluminum Co. of America, 2471 Oliver Bldg., Pittsburgh.
Aluminum Industries Inc., 2438 Beekman, Cincinnati, O.
American Brass Co., Waterbury, Conn.
Anaconda. See American Brass Co.
American Die Casting Co., 2040 Dominick, Chicago, Ill.
Badger Die Casting Co., 156 East Buffalo, Milwaukee, Wis.
Barnhardt Bros. & Spindler, Monroe & Throop St., Chicago.
Bohn Aluminum & Brass Corp., Detroit, Mich.
Bohnalite. See Bohn Aluminum & Brass Corp.
Du-Di. See Doehler Die Casting Co.
Doehler Die Casting Co., 386 Fourth Ave., New York, N. Y.
Federal-Mogul Corp., Shoemaker & Lillibridge Sts., Detroit,
Franklin Die Casting Corp., 826 Gifford, Syracuse, N. Y.
Illinois Die Castings Co., 551 W. Congress, Chicago, Ill.
Krone-Seebek Die Casting & Mfg. Co., 2935 W. 47th, Chicago, Ill.
Milwaukee Die Casting Co., 289 Fourth, Milwaukee, Wis.
Newton Die Casting Corp., 146 Munson, New Haven Conn.
Paragon Die Casting Co., 2701 N. Crawford Ave., Chicago.
Perfection Die Casting Corp., 406 Lakeside Ave., N. W., Cleveland, O.
Permite. See Aluminum Industries, Inc
Phoenix Die Castings Co., 21 Illinois, Buffalo, N. Y.
Stewart Die Casting Co., 4500 Fullerton Ave., Chicago, Ill
Superior Die Casting Co., 875 E. 70th, Cleveland, Ohio
Twin City Die Castings Co., Talmadge and 33rd Aves., S. E., Minneapolis, Minn. (White Metal).

CASTINGS, Gray Iron

American Engineering Co., Philadelphia, Pa.
Athens Foundry Co., Athens, Pa.
Barlow Foundry Co., 551 N. J. R. R. Ave., Newark, N. J.
Barnett Foundry Co., Newark, N. J.
Berks Foundry & Mfg. Co., West Hamberg, Pa.
Bonnell Elec. Mfg. Co., 192 Chambers, New York, N. Y.
Bridgeport Castings Co., 250 North Ave., Bridgeport, Conn.
Chicago Hardware Foundry Co., North Chicago, Ill.
Dick Bros., Inc., Reading, Pa.
Eastern Malleable Iron Co., Naugatuck, Conn.
Fairmount Foundry, Inc., Third & Westmoreland Sts., Philadelphia, Pa.
Forest City-Walworth Run Fuondries Co., 2500 W. 27th, Cleveland, O.
Gray Iron Foundry Co., Reading, Pa.
Milwaukee Grey Iron Foundry Co., 3910 Mitchell, Milwaukee, Wis.
North Lebanon Foundry Co., Second & Canal, Lebanon, Pa.
North Wales Mach Foundry Co., North Wales, Pa
Products Machine Co., Bridgeport, Conn.
Sacks Iron Foundry, L., 357 Wilson Ave., Newark, N. J.
Snead & Co. Pine St., Jersey City, N. J.
Southern Malleable Iron Co., 21st St. and Bond Ave., East St. Louis, Ill.
St. Louis Malleable Castings Co., 7701 N. Conduit Ave., St. Louis, Mo
Union Mfg. Co., New Britain, Conn.
Western Foundry Co., Kedzie Ave. at 36th, Chicago, Ill.

CASTINGS, Steel

Bonney-Floyd Co., Columbus, Ohio.
Eastern Steel Casting Co., Ave. L & Edward St., Newark
Northwestern Steel & Iron Corp., 2907 Fourth, S. E., Minneapolis, Minn.
Pittsburgh Malleable Iron Co., Pittsburgh, Pa.
Procisn. See Northwestern Steel & Iron Corp.
Riverside Steel Casting Co., Jacobus Ave., Kearney, N. J.

CEMENT, Commutator

Anchorlute. See Technical Products Co.
Commutator Companion. See Withington Div. of Marnot Co.
Conductalute. See Technical Products Co.
Early, Edward E., 1129 W. Fifth, N. W., Canton, O.
Fixkwick. See Technical Products Co.
Ideal Commutator Dresser Co., 1039 Park Ave., Sycamore, Ill.
Imperial See Martindale Electric Co.
Martindale Elec. Co., 1262 W. Fourth, Cleveland, O.
Mitchell Rand Mfg. Co., 19 Vesey, New York, N. Y.

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Perce-Lute. See Perfection Supply Co.
Perfection Supply Co., 98 Park Pl., New York, N. Y.
Plas Mica Co., 26 St Andrews Place, Yonkers, N. Y.
Technical Products Co., Pittsburgh, Pa.
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa
Withington Div. of Marnot Co., 50 Thayer, Boston, Mass.

CEMENT, Liquid Porcelain

Anchorlute. See Technical Products Co
Fire Lute. See Technical Products Co.
Insa-Lute. See Technical Products Co.
Okonite Co., Passaic, N. J.
Patch-O-Namel. See Technical Products Co.
Repairet Mfg. Co. Milwaukee, Wis.
Stupakoff Laboratories, 6627 Hamilton Ave., Pittsburgh, Pa.
Technical Products Co., Pittsburgh, Pa.
Thermold. See Technical Products Co.

CHAIN, Chandelier (Fancy). See Crystals, Chandelier
CHAIN DRIVES. See Chain, Power Transmission

CHAIN, Fixture

Acco. See American Chain Co.
American Chain Co., Bridgeport, Conn.
Chase Brass & Copper Co.
Eastern Chair Works, 309 E. 22nd St., New York, N. Y.
Faries Mfg. Co., Decatur, Ill.
Globe Metal Mfg. Co., 2122 E. Hazard, Philadelphia, Pa
H. & O. Chain Co., So. Norwalk, Conn.
Newark Metal Mfg. Co., 22 S. 6th, Newark, N. J.
Plume & Atwood Mfg. Co., Waterbury, Conn.
Rodale Mfg. Co., 200 Hudson, New York, N. Y.
Steelt & Johnson Mfg. Co., Waterbury, Conn.
Universal Metal Chain Co., 75 Clymer, Brooklyn, N. Y

CHAIN, Power Transmission

Baldwin Chain & Mfg. Co., Worcester, Mass
Boston Gear Wks. Sales Co., Norfolk Downs, Mass
Diamond Chain & Mfg. Co., Indianapolis, Ind
Link-Belt Company, 910 S. Michigan Ave., Chicago, Ill.
Morse Chain Co., Ithaca, N. Y.
Ramsey Chain Co., Inc., Albany, N. Y.
Reeves Pulley Co., Columbus, Ind.
Renold Boston. See Boston Gear Wks.
Union Chain & Mfg. Co., Sandusky, O.
Whitney Mfg. Co., Hartford, Conn.

CHAIN, Socket

American Ball Chain Works, 13 Wooster St., New York.
Bead Chain Mfg. Co., Bridgeport, Conn.
H. & O. Chain Co., South Norwalk, Conn.

CHANDELIER BEADS. See Crystals, Chandelier
CHANDELIER CRYSTALS. See Crystals, Chandelier
CHANDELIER FRINGE. See Crystals, Chandelier

CHARGERS, Magnet

Charging, Remagnetizing.
Colpin Corp., 6110 S. Main, Los Angeles, Cal.
Cowie Elec. Co., E. S., 1823 Wyandotte, Kansas City, Mo
Fore Elec. Mfg. Co., 5255 Wabada Ave., St. Louis, Mo
Scintilla Magneto Co., Inc., Sidney, N. Y.
Serwell Sales Corp., 1749 N. Winchester Ave., Chicago
Valley Electric Co., 4221 Forest Park Blvd., St. Louis, Mo.

CHEMICALS, Battery

Electrolyte, Battery Salts, Battery Oxides, Sal Ammoniac, Bluestone, Manganese.
Cooper & Co., Charles, 194 Worth, New York, N. Y.
Eagle-Picher Lead Co., 134 N. LaSalle, Chicago. (Oxide.)
Elmer & Amend, 205 3rd Ave., New York, N. Y.
Electrex. See Goodyear Chemical Co., Inc.
Electro Chemical Co., 113 W. Court St., Dayton, O.
General Metallic Oxides Co., Jersey City, N. J.
Globe Chemical Co., Murray Rd. and Big Four R. R., Cincinnati, O.
Goodyear Chemical Co., Inc., 20 W. 22nd, New York, N. Y.
Grasselli Chemical Co., Guardian Bldg., Cleveland, O
Kalbfleisch Corp., 200 5th Ave., New York, N. Y.
Klipstein Co., 644 Greenwich, New York, N. Y.
Merrimac Chemical Co., 148 State, Boston, Mass.
Powers-Weightman-Rosengarten Co., Philadelphia, Pa
Voltah. See Powers-Weightman-Rosengarten Co.
Wah Chang Trading Corp., 233 Broadway, New York, N. Y

CHEMICALS, Refrigeration

Ansul Chemical Co., Marinette, Wis.
Arctic. See Roessler & Hasslacher Chemical Co
Carbide & Carbon Chemicals Corp., 30 E. 42nd, New York, N. Y. (Butane & Isobutane.)
Dry Ice Corp. of America, 50 E. 42nd, New York, N. Y.
Roessler & Hasslacher Chemical Co., 709 Sixth Ave., New York, N. Y. (Methyl Chloride, Ethyl Chloride.)
Virginia Smelting Co., West Norfolk, Va. (Sulphur Dioxide.)

Chromium Plating. See Plating & Finishing.

CHUCKS, Magnetic

J & H Elec. Co., 161 Clifford, Providence, R. I.
Simmons. See Taft-Pierce Mfg. Co.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Walker Co., O. S. (Rockdale), Worcester, Mass

CIRCUIT BREAKERS

Air and Oil Circuit Breakers and Oil Break Switches
Allen-Bradley Co., 494 Reed, Milwaukee, Wis.
Anderson Mfg Co., Albert & J. M., 389 A, Boston, Mass
Automatic Reclosing Circuit Breaker Co., Columbus, O.
Automatic Switch Co., 617 E. Larned, Detroit, Mich.
Burke Controller Co., 369 Lexington Ave., New York, N. Y
Cendit Elec'l Mfg. Corp., 838 Summer St. (South Boston) Boston, Mass.
Cramblett Engineering Div. of Time-O-Stat Controls Co., 286 Milwaukee, Milwaukee, Wis.
Cutler-Hammer, Inc., 1288 St. Paul Ave., Milwaukee.
General Electric Co., Section W-234, Merchandise Dept. Bridgeport, Conn.
Hart & Hegeman Div. of Arrow-Hart & Hegeman Elec Co., Hartford, Conn.
Hartman Electrical Mfg. Co., 31 E. Fifth, Mansfield, Ohio
High Tension Elecl. Specialty Co., 500 Washington, Abington, Mass.
Hiteaco See High Tension Elecl. Specialty Co
H. & H. See Hart & Hegeman Div
Inducto-therm. See Allen-Bradley Co

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Line Material Co., South Milwaukee, Wis. (Oil Switches.)
Made Co., R. H., Indianapolis, Ind.
Martindale Elec. Co., 1262 W. Fourth, Cleveland, O.
Minibreaker. See Burke Controller Co.
Moller-Smith Co., 239 Broadway, New York, N. Y.
Sentinel. See Westinghouse Elec. & Mfg. Co.
Takamine Corp., 308 Rawson, Long Island City, N. Y
Tu-Re-Lite. See I. T. E. Circuit Breaker Co
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa

CIRCUIT TESTERS. See Testers, Fuse and Circuit
CLEANER BAGS, Vacuum. See Bags, Vacuum Cleaner.
CLEANER BRUSHES, Vacuum. See Brushes for Vacuum Cleaners.

CLEANERS, Metal

Oakite Products, Inc., 26 Thames, New York, N. Y
CLIPS, Fuse. See Fuse Clips.

CLIPS, Heater Plug

Gray Bros. Co., Plano, Ill.

CLOCK SWITCHES. See Switches, Time.
CLOTH GEARS. See Gears and Pinions, Composition.
CLOTH LOUD SPEAKER DIAPHRAGM. See Cloth, Untreated.
CLOTH RADIO GRILL. See Cloth, Untreated.

CLOTH, Untreated

Doyle & Co., John, 112 Duane, New York, N. Y.
Canvas, "Aeroplane Cloth," Cotton Duck, Drill, Diaphragm Cloth, Grill Fabrics, etc
Mitchell-Rand Mfg. Co., 19 Vesey, New York, N. Y.
Pindall Fabrics Corp., 200 Madison Ave., New York, N. Y. (Grill Cloth).

CLOTH AND PAPER, Insulating

Cloth, Insulated	See C						
Paper, Insulated	See P						
Fibre Paper (Fish Paper)	See F						
Press Board (Fuller Board)	See B						
Silk	See S						
Acme Wire Co., New Haven, Conn.	C	S	P				
Armco See Rogers Paper Mfg. Co.							
Armatite. See Mica Insulator Co							
Behr-Manning Corp., Troy, N. Y.			P				
Brand & Co., William, 268 4th Ave., New York			P				
Campbellite. See National Vulcanized Fibre Co.							
Carboloid Products Corp., 15 Park Row, New York, N. Y.	C		P				
Case Brothers, Inc., Highland, Park, Conn.			P				B
Case Mfg. Co., Unionville, Conn.			P				
Case & Risley Press Paper Co., Oneco, Conn.							
Celoron Co., Bridgeport Pa.			P	F			B
C-F. See National Vulcanized Fibre Co.							
Chicago Mica Co., 345 Campbell, Valparaiso, Ind.	C						
Columbian Rope Co., Auburn, N. Y.			P				
Continental-Diamond Fibre Co., Bridgeport, Pa.			P				
De Jonge & Co., Louis, 69 Duane, New York, N. Y. (Condenser)			P				
Dexstar. See Dexter & Sons.							
Dexter & Sons, C. H., Windsor Locks, Conn (Condenser Tissue.)							
Dielectric Mfg. Co., St. Louis, Mo.	C	S	P				B
Electrite. See West Virginia Pulp & Paper Co.							
Fyberoid. See Wilmington Fibre Specialty Co.							
General Electric Co., Merchandise Dept., Bridgeport, Conn.	C		P				
chandise Dept., Bridgeport, Conn.	C		P				
Hartford City Paper Co., Hartford City, Ind. (Glassine Condenser Tissue).							
Hewitt & Bros., C. B., 16 Ferry, New York	C		P				
Hi-Tex See Stevens Paper Mills.							
Hollingsworth & Vose Co., 333 Washington Boston, Mass.			P				
Incelia. See Parentum Paper Mills Co							
Irvington Varnish & Insulator Co., Irvington, N. J.	C	S	P				
Manning Paper Co., J. A., Troy, N. Y.							B
Mica Insulator Co., 200 Varick, New York	C	S	P				B
Mitchell-Rand Mfg. Co., 19 Vesey, New York, N. Y.			P				
National Vulcanized Fibre Co., Wilmington, Del.				F			
New Jersey Wood Finishing Co., Woodbridge, N. J.	C						
Onmold. See Wilmington Fibre Specialty Co.							
Old Hick. See Hewitt & Bros., C. B.							
Peerless. See National Vulcanized Fibre Co.							
Riegels. See Warren Mfg. Co.							
Rogers Fibre Co., 310 Lincoln, Boston, Mass.				F			
Rogers Paper Mfg. Co., South Manchester, Conn.							B

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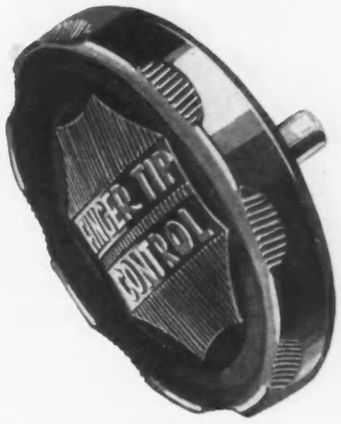

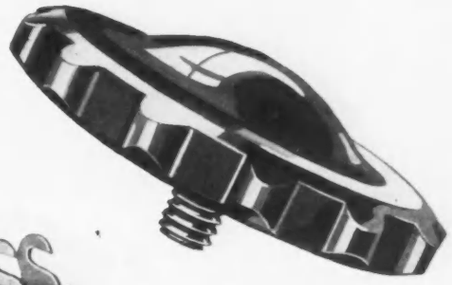

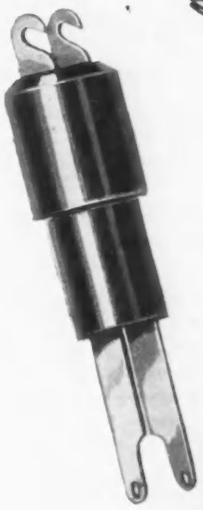

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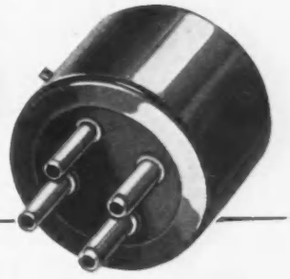

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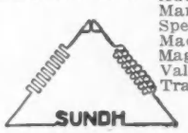

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Schweitzer, Inc., Peter J., 200 Fifth Ave., New York, N. Y. (Condenser Tissue.)
Sico. See Standard Insulation Co.
Standard Insulation Co., East Rutherford, N. J. ..... C S P . . .
Sterling Fireboard Co., 501 Fifth Ave., New York. (Varied Hard Fibreboard) ..... B
Sterlite. See Sterling Firebrand Co.
Stevens Paper Mills, Windsor, Conn. ..... B
Tarentum Paper Mills Co., Tarentum, Pa. ..... P . . .
Turbonite. See Brand & Co., Wm.
Union Mills Paper Mfg. Co., New Hope, Pa. ..... P . . .
Warren Mfg. Co., 342 Madison Ave., New York, N. Y. ..... P . . .
West Virginia Pulp & Paper Co., 230 Park Ave., New York ..... B
Wilmington Fibre Specialty Co., Wilmington, Del. ..... P . . .

CLUTCHES, Magnetic
Cutler-Hammer, Inc., 1288 St. Paul Ave., Milwaukee, Wis.

COIL (Coils).
Armature and Field. See Coils, Finished.
Chokes (Power). See Fittings, High Tension.
Chokes (Radio). See Radio Circuit Components.
Driers & Impregnators. See Ovens.
Electromagnet. See Coils, Finished.
Flatteners. See Rolls, Coil Flattening.
High Frequency. See Electro-Therapeutic; also Radio Circuit Components; also Ignition Outfits.
Impregnators, Vacuum. See Ovens, Industrial.
Induction. See Coils, Finished; also Electro-Therapeutic.
Loop Benders. See Benders, Coil Loop.
Medical. See Electro-Therapeutic.
Presses. See Presses, Armature Coil.
Radio. See Radio Circuit Components.
Removers. See Removers, Coil.
Resistance. See Units, Rods & Grids; also Radio Circuit Components.
Shaping Machines. See Shaping Machines, Coil.
Spark. See Ignition Outfits.
Spreaders. See Winding Machines, Armature & Field Coil.
Tamping Tools. See Tools, Coil Tamping.
Taping Machines. See Taping Machines, Coil.
Testers. See Testers, Coil; also Test Benches, Armature.
Winders, Armature & Field Coil. See Winding Machines, Armature & Field Coil.
Winders, Induction Coil. See Winding Machines, Industrial Coil.
Winding Forms. See Forms, Coil Winding.
Windings (Magneto). See Coils, Finished.
Wire Tension Devices. See Tension Devices, Coil Wire.

COILS, Finished
Armature, Field, Electromagnet and Induction Coils.
Acme Products Co., Boston, Mass.
Acme Wire Co., New Haven, Conn.
Aero-Call. See Aero Products, Inc.
Aero Products, Inc., 4611 Ravenswood Ave., Chicago, Ill.
Auth Electrical Specialty Co., 423 E. 53rd St., New York.
A. & A. See Electrical Coil Winding Co.
Belden Mfg. Co., 2310B S. Western Ave., Chicago, Ill
Bunnell & Co., J. H., 32 Park Place, New York, N. Y
Burke Controller Co., 369 Lexington Ave., New York, N. Y.
Cameron Elec. Mfg. Co., Ansonia, Conn.
Cote Coil Div. of Universal Winding Co., Providence, R. I.
Ditmar Elec. Co., Brookline, Mass.
Dudlo Mfg. Co., Div. of General Cable Corp., Fort Wayne.
Easton Coil Co., Easton, Pa.
Electric Heat Control Co., 5902 Carnegie Ave., Cleveland, O.
Electric Valve Mfg. Co., 68 Murray, New York, N. Y.
Electrical Coil Winding Co., 2735 Saunders, Camden.
Electrical Products Mfg. Co., Providence, R. I.
Fredericks Co., H. M., Lock Haven, Pa.
Globe Technolian Corp., Reading, Mass.
Herald Electric Co., 29 East End Ave., New York, N. Y.
Ince Mfg. Co., Fort Wayne, Ind.
Marion Elec. Mfg. Co., 24 Cliff, Jersey City, N. J.
Modern Elec Mfg. Co., 312 Mulberry, Toledo, Ohio.
National Elec. Corp., 228 High, Newark, N. J.
Pifer Elec. Repair & Mfg. Co., 3610 Superior Ave., Cleveland, O.
Polymet Mfg. Co., 829 E. 134th St., New York, N. Y.
Robertson-Davis Co., 361 W. Superior, Chicago, Ill.
Robston, Leo F., Inc., 532 West 22nd St., New York, N. Y.
Rome Wire Co. (Div. of General Cable Corp.), Rome, N. Y.
Sevisor Magneto Engrg. Co., 397 Phillips, Toledo, O.
States Co., 19 New Park Ave., Hartford, Conn.
Stuns & Barron, 210 E. Pratt, Baltimore, Md.
Toledo Standard Commutator Co., 2242 Smead Ave., Toledo, O.
Varley Duplex Magnet Co., 15 Exchange Place, Jersey City, N. J. (Electromagnetic only).

COMMUTATOR
Bars. See Bars, Commutator.
Cement. See Cement, Commutator.
Dressers. See Stones, Commutator.
Lubricants. See Compounds, Commutator.
New. See Commutators.
Refilled. See Repairing and Second Hand.
Slotters. See Slotting Machines & Tools, Commutator.
Slotting Files. See Files, Commutator Slotting.
Soldering Machines. See Soldering Machines, Commutator.
Stones. See Stones, Commutator.
Tighteners. See Tighteners, Commutator.
Truing Devices. See Tools, Commutator Truing.

COMMUTATORS
Cameron Electric Mfg. Co., 205 Main, Ansonia, Conn.
Derby Commutator Co., Derby, Conn.
Electric Materials Co., North East, Pa.
Eureka Metal Products Corp., 91 Clay, North East, Pa.
Homer Commutator Co., 4748 Hough Ave., N. E., Cleveland, O.
Toledo Standard Commutator Co., Toledo, O.

COMMUTATOR BRUSHES. See Brushes, Commutator.
COMPOSITION PULLEYS. See Pulleys, Composition.

COMPOUNDS, Commutator
Allen Co., Inc., L. B., 6750 Bryn Mawr Ave., Chicago, Ill.
Armstrong. See Elec. Power Maintenance.
Consistency. See Warren Lubricant Co.
Cramolin, Inc., 25 W. 43rd St., New York, N. Y.
Dixon Crucible Co., Jos., Jersey City, N. J.
Doe & Co., Walter S., Kent, Ohio.
Gales. See McLennan & Co.
Goldmark Co., James, 83 Warren, New York, N. Y.
Kester Solder Co., 4210 Wrightwood Ave., Chicago, Ill.
McLennan & Co., K., 1751 West 35th, Chicago.
Perfection. See Warren Lubricant Co.
Sanderson. See Warren Lubricant Co.
Spermo. See Warren Lubricant Co.
Trotters. See Goldmark Co., James.
Warren Lubricant Co., 22 Maurice, Buffalo, N. Y.
COMPOUNDS, Sealing. See Wax and Compounds.

CONDENSER UNITS, Refrigerator
Bush Mfg. Co., Hartford, Conn.
McCord Radiator & Mfg. Co., Riopelle & E. Grand Ave., Detroit, Mich.
Rome-Turney Radiator Co., Rome, N. Y.
CONDENSERS, Radio. See Radio Circuit Components.
CONDENSER TUBING. See Tubing, Brass and Copper.

CONNECTORS, Pin-Plug
Kliegl Bros. Universal Electric Stage Ltg. Co., 321 W. 50th, New York, N. Y.

CONNECTORS, Wire
Ideal Commutator Dresser Co., 1039 Park Ave., Sycamore, Ill. (Solderless-Tapeless).
CONTACT POINTS. See Points, Contact.
CONTAINERS, Shipping. See Fibre Board Products.

CONTROLLERS, Motor
Allen-Bradley Co., 494 Reed, Milwaukee, Wis.
Anderson & Co., C. J., 53 W. Jackson Blvd., Chicago, Ill.
Automatic Switch Co., 154 Grand, New York, N. Y.
Betts, Inc., James H., 1393 Sedgwick Ave., New York, N. Y. (Traffic.)
Burke Controller Co., 369 Lexington Ave., New York, N. Y.
B-Q Oil Burner Co., Stockton, Cal.
Clark Controller Co., 1146 E. 152nd, Cleveland, O.
Condit Elec'l Mfg. Corp., 838 Summer St. (South Boston), Boston, Mass.
Cutler-Hammer Mfg. Co., 1288 St. Paul Ave., Milwaukee.
Diamond Elect. Mfg. Co., 1330 N. 16th, Los Angeles, Cal.
Dinkey. See Elec. Controller & Mfg. Co.
E C & M Youngstown. See Electric Controller & Mfg. Co.
Electric Controller & Mfg. Co., 2700 E. 79th, Cleveland, O.
Electrite. See Sundh Elec. Co.
General Electric Co., Schenectady, N. Y.
Horni Signal Mfg. Corp., 515 Greenwich, New York.
Industrial Controller Div. of Square D Co., S. Pierce & Hanover, Milwaukee, Wis.
Maimin Speed Control Corp., 251 W. 19th, New York. (Sewing Machines.)
Monitor Controller Co., 51 Gay, Baltimore, Md.
National Electric Controller Co., 5315 Ravenswood Ave., Chicago, Ill.
Refrigerating Specialties Co., 728 S. Sacramento Blvd. Chicago, Ill.
Resisto. See Allen-Bradley Co.
Rowan Controller Co., 306 N. Holliday, Baltimore, Md.
Square D Co., 6060 Rivard, Detroit, Mich.
Sundh Elec. Co., Parkhurst St. at Ave. C, Newark, N. J.
Switcholone. See Condit Elec. Mfg. Co.
Thermaload. See Monitor Controller Co.
Trumbull Electric Mfg. Co., Plainville, Conn.
Uemco. See Union Elec. Mfg. Co.
Unelco. See Union Elec. Mfg. Co.
Union Elec. Mfg. Co., 934 Juneau Ave., Milwaukee, Wis.
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa
W. K. See Westinghouse Elec. & Mfg. Co.
COPPER. See Brass, Bronze and Copper; also Castings.
COPPER TUBING. See Tubing, Brass and Copper.
CORD TIPS. See Tips, Cord.
CORD, Tinsel. See Tinsel Cord & Thread.

CORDS, Extension
Stupakoff Laboratories, 6627 Hamilton Ave., Pittsburgh, Pa.

CORES, RESISTANCE COIL (Lava)
American Lava Corp., 1425 William, Chattanooga, Tenn
Crescent. See M. Kirchberger & Co.
Es-El-Co. See Southern Lava Co.
Kirchberger & Co., M., 1425 37th, Brooklyn, N. Y.
Lavite. See Steward Mfg. Co.
Lavarock. See M. Kirchberger & Co.
Southern Lava Co., Roesville, Ga.
Steward Mfg. Co., D. M., Chattanooga, Tenn.
Tennessee Burner Mfg. Co., Chattanooga, Tenn.
XL. See Tennessee Burner Mfg. Co.

CORES, RESISTANCE COIL (Refractory Porcelain)
American Lava Corp., 1425 William, Chattanooga, Tenn
Colonial Insulator Co., Akron, O.
Crowley & Co., Henry L., 545 N. Arlington Ave., East Orange, N. J.
Electrical Refractories Co., East Palestine, O
Elemite. See Louthan Mfg. Co.
Firelite. See Hartford Faience Co.
Hartford Faience Co., Hartford, Conn.
Louthan Mfg. Co., E. Liverpool, O.
Stupakoff Laboratories, 6627 Hamilton Ave., Pittsburgh, Pa.
Thermal Syndicate, 58 Schenectady Ave., Brooklyn, N. Y.
Vitreosil. See Thermal Syndicate.
Woolley, Inc., W. Douglas, East Liverpool, O.
COTTON DUCK. See Cloth, Untreated.
COTTON SLEEVING. See Tape, Cotton.
COUNTERS, Revolution. See Tachometers.

COUPLINGS, Shaft (Flexible-Insulated)
Ajax Flexible Coupling Co., Westfield, N. Y.
Bartlett Hayward Co., Baltimore, Md.
Bond Co., Charles, 617 Arch, Philadelphia, Pa.
Brown Engineering Co., 123 N. Third, Reading, Pa.
Falk Corp., Milwaukee, Wis.
Delbee Rubber Co., Syracuse, N. Y.
Francke. See Smith & Serrell.
General Electric Co., Schenectady, N. Y.
Grundy. See Bond Co.
Kanti Lever. See Brown Engineering Co.
Krone-Seebek Die Casting & Mfg. Co., 2935 W. 47th, Chicago, Ill.
Lipe, W. C., Syracuse, N. Y.
Lovejoy Tool Wks., 325 W. Ohio, Chicago, Ill.
Mather. See Bond Co.
Nuttall Wks., of Westinghouse Elec. & Mfg. Co., McCandless Ave. & Harrison St., Pittsburgh, Pa.
Oneida. See Delbee Rubber Co.
Smith & Serrell, 5 Halsey, Newark, N. J.
Webster Mfg. Co., 1856 N. Kostner Ave., Chicago, Ill.
Wood's Sons Co., T. B., Chambersburg, Pa.
COVERING MACHINES, WIRE. See Wire Manufacturing Machines.

CUPS, Grease
Bowen Products Corp., Auburn, New York.
Gits Bros. Mfg. Co., 1960 S. Kilbourn Ave., Chicago, Ill.
Lenkenheimer Co., Cincinnati, Ohio.

CUPS, Oil
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CUT OUTS, Battery. See Switches, Battery.
CUTTING OUTFITS, Metal. See Welding and Cutting Outfits.
CRANES, Floor. See Lifts, Armature.

CRYSTALS, Chandelier
Crystals, Prisms, Beads, Chains, Fringes.
Crystal Venezia. See Harrison & Co., Arthur.
Foslite. See Harrison & Co., Arthur.
Friedlaender Co., 49 W. 23rd, New York, N. Y.
Harrison & Co., Arthur, 561 W. Washington Blvd., Chicago.
Hirschberg, Shutz & Co., 288 4th Ave., New York, N. Y. (Fringes.)
Nelson Bead Co., 15 W. 37th, New York, N. Y. (Importer.)
Rialto Import Co., 112 W. 4th, New York, N. Y.
Schwartz Lighting Fixture Wks., 1341 Noble, Philadelphia
Wyle & Bros., J. J., 20 E. 27th, New York, N. Y.
CURRENT INDICATORS. See Instruments, Pocket.
DASHBOARD METERS. See Instruments, Portable and Switchboard.

DECALCOMANIA
Meyercord Co., 120 S. La Salle, Chicago, Ill.
Novar. See Palm Fechteler & Co.
Palm Fechteler & Co., 57 5th Ave., New York, N. Y.

DIALS
Radio (Metal). See Radio Mountings.
Radio (Molded). See Radio Molded Parts
Enameled. See Dials, Enameled.

DIALS, Enameled
Whittier Co., Horace R., Pequabuck, Conn.
DIAPHRAGM, Cloth. See Cloth, Untreated.
DIE CASTINGS. See Castings, Die.
DIE MAKERS. See Dies, Die Makers.

DIE SETS
Baumbach Mfg. Co., 1810 Kilbourn Ave., Chicago, Ill.
Danly Machine Specialties, Inc., 2104 S. 52nd Ave., Chicago, Ill.
DIES, Pipe. See Stocks, Dies and Reamers.

DIES, DIE MAKERS
Beaver Mfg. Co., 625 N. Third, Newark, N. J.
Eureka Tool & Machine Co., 42 Walnut, Newark, N. J.
Holm's Mfg. Co., Kenosha, Wis.
Kuhn & Jacob Machine & Tool Co., 502 Prospect Ave., Trenton, N. J.
Mareck & Nebel, 255 Greenwich, New York, N. Y.

DISCS, Armature
Steel Discs, Laminations, and Segments for Motors and Transformers.
American Stamping Co., 978 E. 64th, Cleveland, O.
Cleveland Armature Works, 4732 St. Clair Ave., Cleveland.
Hercules Elec. Steel Corp., 145 Lafayette, New York, N. Y.
Lamination Stamping Co., 764 Windsor, Hartford, Conn.
Niagara Machine & Tool Wks., 637 Northland, Buffalo, N. Y.
Valley Appliances, Inc., 634 Lexington Ave., Rochester, N. Y.
Willor Mfg. Corp., 117 Mercer, New York, N. Y.
DRAWING MACHINES, WIRE. See Wire Drawing Machines.
DRIVE SCREWS. See Screws, Drive.
DRIVES, CHAIN. See Chain, Power Transmission.

DYNAMOMETERS
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.
Clark Controller Co., 1146 E. 152nd, Cleveland, O.
Diehl Mfg. Co., Elizabeth, N. J.
General Electric Co. Schenectady.
EBONITE. See Rubber, Hard.
ELECTROLYTE. See Chemicals, Battery.
ELECTROMAGNETS. See Coils, Finished.

ELECTRODES FOR GAS SIGNS
American Neon Sign Corp., 549 W. 132nd St., New York, N. Y.
Eisler Electric Corp., 756 S. 13th, Newark, N. J.
Manhattan Elecl. Supply Co., 510 Sixth Ave., New York.
Q. R. S. De Vry Corp., 333 N. Michigan Ave., Chicago, Ill.
ELECTRODYNAMOMETERS. See Instruments, Laboratory Standard.
ELEMENTS, Heating. See Units, Rods and Grids.

ENAMELING MACHINES (For Magnet Wire)
(See Also Wire Manufacturing Machines).
American Insulating Machinery Co., 519 Huntington Ave., Philadelphia, Pa.
Sleeper & Hartley, Inc., 335 Chandler, Worcester, Mass

ENGRAVING MACHINES
Portable Bench and Pedestal Outfits for Marking Metal.
Brewster Co., Wm., 30 Church, New York, N. Y.
Deckel. See Preis & Co., Inc., H. P.
Eisler Electric Corp., 756 S. 13th, Newark, N. J. (Tube Base Branders)
Engravograph Corp., 12 Vestry, New York, N. Y.
Etchograph. See Brewster Co., Wm.
Gilbert Supply Co., Independence, Iowa.
Gorton Machine Co., Geo., Racine, Wis.
Preis & Co., Inc., H. P. Newark, N. J.
Schmidt, Inc., Geo. T., 4100 Ravenswood Ave., Chicago, Ill.

ENGRAVING, Radio Panel
Engraving to Order.
Eastern Specialty Co., 3551 N. Fifth, Philadelphia, Pa.
Etch-O-Gravure. See Insuline Corp. of America.
General Fabricating Co., 165 Greenwich, New York, N. Y.
Globe Mfg. Co., 101 Spokane St., Seattle, Wash.
Insuline Corp. of America, 78 Cortlandt, New York, N. Y.
New England Products Co., 233 Greenwich, New York.
Preis & Co., Inc., H. P., 227 Fulton, New York, N. Y.
Schmidt, Inc., Geo. T., 4102 Ravenswood Ave., Chicago, Ill. (Tube Base Branders).
Schwenke Machine Engraving Co., 2036 Woodward Ave., Detroit, Mich.
Verichrome Laboratories, 4614 Spring Grove Ave., Cincinnati.
Wright Radio Co., 114 Exchange, Rockland, Mass.

EYELETS
Platt Bros. & Co., Waterbury, Conn.

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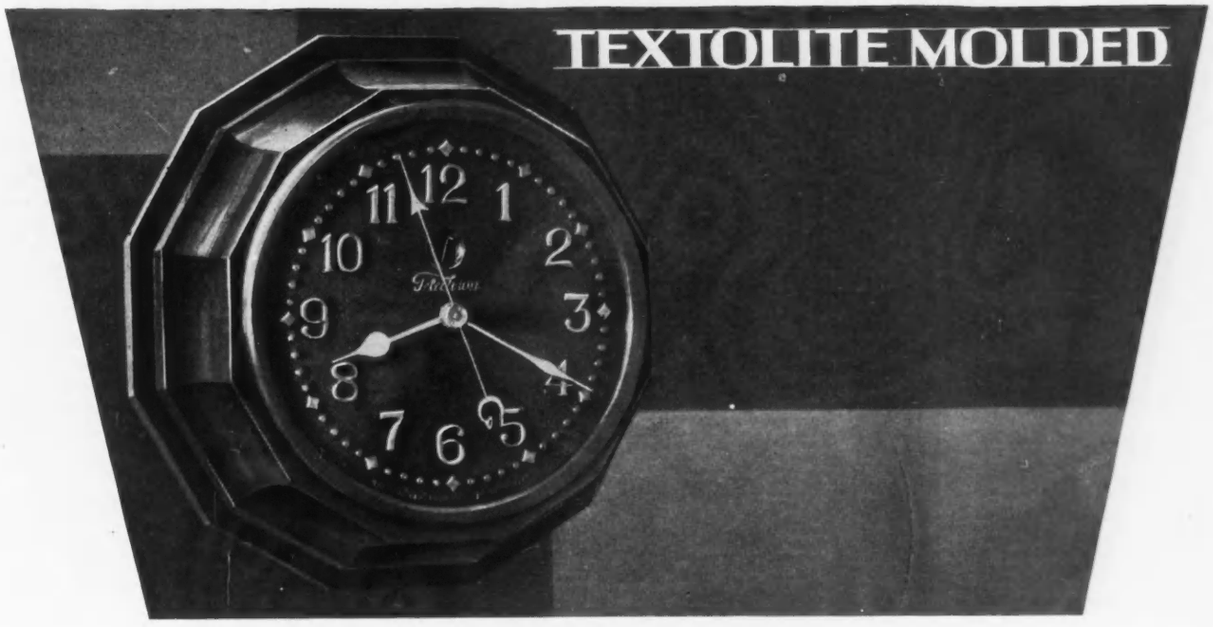

AS modern as the Telechron itself is this attractive Textolite molded clock case, molded by General Electric for the Warren Telechron Company. The case, with raised numerals, is fabricated in one piece, coming direct from the molds with its rich walnut finish that will never require polishing or refinishing. It is an excellent example of the molder's art. ¶In this Telechron case—and in all Textolite molded products—are incorporated all the experience and technique acquired by General Electric in producing half a billion moldings. ¶Thus Textolite molded, attractive, durable, dielectric, combining General Electric's unexcelled facilities for research and for production, gives *complete* satisfaction to all users of molded parts.

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Waterbury Button Co., 835 S. Main, Waterbury, Conn.
FABRIC, Radio Grill. See Cloth, Untreated.
FABRIC SHADES. See Shades, Fabric.
FAN BLADES. See Blades, Fan.

FEET, Felt
Brawley, T. R., 279 20th, Brooklyn, N. Y.

FELT
Advance Felt & Cutting Co., 607 W. Lake, Chicago.
American Felt Co., 211 Congress, Boston, Mass.
Booth Felt Co., 460 18th, Brooklyn, N. Y.
Brawley, T. R., 279 20th, Brooklyn, N. Y.
Western Felt Wks., 4029 Ogden Ave., Chicago, Ill.

FERRULES
Chase Brass & Copper Co., Waterbury, Conn.
Clark Metal Products, 490 Hancock Ave., Bridgeport, Conn.
Grammes & Sons, Inc., L. F., Allentown, Pa.
Massachusetts Machine Shop, Inc., Boston, Mass.
Patton-MacGuyer Co., Providence, R. I.
Platt Bros. & Co., Waterbury, Conn.
Risdon Mfg. Co., Naugatuck, Conn.
Scovill Mfg. Co., 99 Mill, Waterbury, Conn.
Waterbury Brass Goods Corp., Waterbury, Conn.
Waterbury Button & Moulding Co., Waterbury, Conn.

FIBRE BOARD PRODUCTS (Solid and Corrugated)
Container Corp. of America, 111 W. Washington, Dept. 36, Chicago, Ill.
Mid-West Box Co., 111 W. Washington, Chicago.
Serton Mfg. Corp., 59 E. Madison, Chicago, Ill.
FIBER CANDLES. See Candles, Fixture.
FIBRE GEARS. See Gears and Pinions, Composition.
Paper. See Cloth and Paper.
Radio Panels. See Radio Molded Parts.
Shipping Containers. See Fibre Board Products.
Vulcanized. See Fibre, Vulcanized.

FIBRE, Phenol
Moisture Proof; Sheet, Rod, Tubes.
Aico. See American Insulator Corp.
Amerine. See American Insulator Corp.
Armite. See Spaulding Fibre Co.
Bakelite-Dilecto. See Continental Fibre Co.
Continental-Diamond Fibre Co., Bridgeport, Pa.
Fibroc Insulation Co., 245 Lincoln Ave., Valparaiso, Ind.
Formica Insulation Co., 4638 Spring Grove Ave., Cincinnati, O.
Franklin Fibre Specialty Co., Wilmington, Del.
Micarta. See Westinghouse Elec. & Mfg. Co.
National Vulcanized Fibre Co., Wilmington, Del.
Phenolite. See National Vulcanized Fibre Co.
Spaulding Fibre Co., Tonawanda, N. Y.
Synthane Corp., Oaks, Pa.
Vul-Cot. See National Vulcanized Fibre Co.
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.

FIBRE, Vulcanized
Sheet, Rod, Tube, Horn, Fibre, Bushings, Washers, Cleats, Screw Machine Products.
Brandywine Fibre Products Co., 1402 Walnut St., Wilmington, Del.
Conite. See Continental-Diamond Fibre Co.
Continental-Diamond Fibre Co., Bridgeport, Pa.
Delaware Hard Fibre Co., Box 790M, Wilmington, Del.
Diamond F. See Continental-Diamond Fibre Co.
Egyptian. See Delaware Hard Fibre Co.
Electrosote. See Pantasote Co.
Fibro Products Co., New Bedford, Mass.
Franklin Fibre Specialty Co., Wilmington, Del.
Fyberoid. See Wilmington Fibre Specialty Co.
Independent Laboratories, 50 E. 42nd, New York, N. Y.
Iten Fibre Co., 5403 Hower Ave., Cleveland, O.
Leatheroid. See Rogers Fibre Co.
Lincoln Fibre & Specialty Co., Newport, Del.
National Vulcanized Fibre Co., Wilmington, Del.
Ohmoid. See Wilmington Fibre Specialty Co.
Pantasote Co., Inc., 250 Park Ave., New York, N. Y.
Peerless. See National Vulcanized Fibre Co.
Rogers Fibre Co., 218 Lincoln, Boston, Mass.
Spaulding Fibre Co., Tonawanda, N. Y.
Standard Fibre Products Co., 36 Pleasant, Watertown, Mass.
Vul-Cot. See National Vulcanized Fibre Co.
Vulcawood. See Continental-Diamond Fibre Co.
Wilmington Fibre Specialty Co., Wilmington, Del.
FIBRE WASHERS. See Fibre.
FIELD COILS. See Coils, Finished.

FILAMENTS, Incandescent Lamp
Cohn, Sigmund, 44 Gold, New York, N. Y.
Conneway Elec. Laboratories, 406 Jefferson St., Hoboken.
Filament Supply Co., 1317 Willow Ave., Hoboken, N. J.
Gilby Wire Co., Riverside Ave., Newark, N. J.
National-Harris Wire Co., 195 Verona Ave., Newark, N. J.
Radio Products Corp., Steneck Trust Bldg., Hoboken, N. J
Suter & Nustxi, 3709½ Lisbon Ave., Milwaukee, Wis.
Volkmar & Sons, 187 Sylvan Ave., Newark, N. J.
(Lead-in-Welds.)

FILES, Commutator Slotting
Ideal Commutator Dresser Co., 1039 Park, Sycamore, Ill.
Martindale Electric Co., 1262 W. Fourth, Cleveland, O.
FISH PAPER. See Cloth and Paper.
FITTINGS, Fixture. See Fixture Fittings.
FIXTURE CANDLES. See Candles, Fixture.
FIXTURE CHAIN. See Chain, Fixture.
FIXTURE, Collars. See Fixture Fittings.

FIXTURE FITTINGS

	KEY
Bowl Holders	See B
Brass Fittings	See B
Canopies	See B
Collars	See B
Crow Feet	See I
Finials (Brass, Glass and Porcelain)	See B
Hangers	See H
Hickies, Brass	See B
Hickies, Iron	See I
Hooks, Brass	See B
Hooks, Iron	See I
Iron Fittings	See I
Loops, Brass	See B
Loops, Iron	See I
Rings	See B
Shade Holders	See S
Shells	See B
Spinnings	See B
Stampings	See B
Stems	See B
Straps	See H
Studs	See I

Acme Lighting Products, Inc., 2114 Woodland Ave., Cleveland, O. Straps . . . . . B
American Chain Co., Bridgeport, Conn. (Loops and Rings.) . . . . . B . . . . .
American Ring Co., Waterbury, Conn. (Candle.) . . . . S . .
Appleton Electric Co., 1703 Wellington Ave., Chicago, Ill. . . . . B I . . . .
Arco. See American Ring Co.
Arrow Electric Division of Arrow-Hart & Hegeman Elec. Co., Hartford, Conn. . . . . S . .
Artoloid. See Great Eastern Brass Wks., Inc.
Art Metal Co., 3721 Dayton, Cleveland, O. . . . . H
Banlite. See East Side Metal Spinning Co.
Banner. See Plume & Atwood Mfg. Co.
Barton Brass Wks., 3627 Superior, Detroit. . B . . . . .
Belmet. See B. & L. Metal Stamping Co.
Bloch Bros., 88 Walker, New York. . . . . B . . . . .
Brandt Mfg. Co., 3727 Gratiot Ave., Detroit. B . . . . .
Braun, J. G., 609 S. Pauline, Chicago, Ill. (Pressed Ornaments.) . . . . . B I . . . .
B. & L. Metal Stamping Co., 250 Moore, Brooklyn, N. Y. (Also Combination Wall Bracket Hanger.) . . . . . B I . . H
Cambridge Brass Co., Cambridge, Mass. . . . . B . . . . .
Chase Brass & Copper Co., Waterbury, Conn. B . . S . .
Chatham Metal Spinning & Stamping Corp., 128 Mott, New York, N. Y. . . . . B I . . . .
Cleanezy. See Dunlap Co.
Colonial Stamping Co., Brill St. & Passaic Ave., Newark, N. J. . . . . B . . S . .
Crescent Brass Mfg. Co., Reading, Pa. . . . . B . . . . .
Crouse-Hinds, Solvay Sta., Syracuse, N. Y. . . . . S H
Diamond Needle & Mfg. Co., Torrington, Conn. (Hickies.) . . . . . I . . .
Dunlap Co., John, Carnegie, Pa. . . . . S . .
East Side Metal Spinning Co., 451 Greenwich, New York, N. Y. . . . . B . . . . .
Eureka Tin Ware Mfg. Co., 135 W. 20th, New York, N. Y. . . . . S . .
E-Z Up. See Plume & Atwood Mfg. Co.
Faries Mfg. Co., Decatur, Ill. . . . . B I S H
Flaherty Co., M. E., 28 S. Clinton, Chicago. . . I . . .
Fralick Co., S. R., 15 S. Clinton, Chicago. . . I . . .
Franklin Brass Foundry Co., Reading, Pa. . . . B . . . . .
Friedley-Voshardt Co., Chicago. . . . . B . . . . .
Grabler Mfg. Co., 6565 Broadway, S. E., Cleveland, O. . . . . I . . .
Great Eastern Brass Wks., Inc., 182 Grand, New York, N. Y. (Spindles).
Hart & Hegeman, Div. of Arrow-Hart & Hegeman Elec. Co., Hartford, Conn. . . . . S . .
Incandescent Supply Co., 468 West Broadway, New York, N. Y. . . . . B . . . H
Isco. See Incandescent Supply Co.
Jiffy. See White Mfg. Co., J. H.
Kwikon. See Fralick Co., S. R.
Lakin. See Thomas & Betts Co.
Liberty Brass Turning Co., 88 Walker, New York, N. Y. . . . . I . . .
Liberty Iron Pipe & Nipple Works, 62 Greene, New York, N. Y. . . . . B I . . .
Liberty Machine Co., Wauwatosa, Wis. . . . . B I . . .
Light Metal Stamping Co., 310 13th St., West New York, N. J. . . . . S . .
L & K Mfg. Co., 440 Adelphi, Brooklyn, N. Y. . . . . H
L. & W. Brass Wks., 301 W. Superior, Chicago, Ill. . . . . B . . . .
Madelite. See Belson Mfg. Co.
M. S. W. Mfg. Co., 1527 Niagara Ave., Buffalo, N. Y. . . . . I . . .
Meta. Products Co., 210 Canal, New York. . . . B . . . .
Metro Iron Ornament Co., 191 Christie, New York, N. Y. . . . . I . . .
Metropolitan-Columbia Mfg. Co., 714 Metropolitan Ave., Brooklyn, N. Y. . . . . B . . . .
Midwest Elec. Co., 1639 Walnut, Chicago, Ill. . . I . . .
Mid-West Chandelier Co., 14th & Chestnut Sts., Kansas City, Mo. . . . . B . . . .
Michell-Vance Co., 70 Washington, Brooklyn, N. Y. . . . . S . .
Monarch. See Perfecilite Co.
Murlin Mfg. Co., Philadelphia, Pa. . . . . B I . . .
National Electric Products Corp., Pittsburgh, Pa. (Studs.) . . . . . I . . .
New Era Elec. Mfg. Co., 6725 Machinery Ave., N. E., Cleveland, O. . . . . H
New Wrinkle. See Bryant Elec. Co.
New York Brass Turning Co., 568 Broadway, New York, N. Y. . . . . B . . . .
Nobolt. See Fralick & Co., S. R.
N. W. Cleat Receptacle Bracket, 2437 N. 29th, Philadelphia, Pa. . . . . I . . .
Onli. See Perfecilite Co.
Pass & Seymour, Solvay Sta., Syracuse, N. Y. B . . S . .
Perfecilite Co., 1457 E. 40th, Cleveland. . . . . S . .
Pittsburgh Valve & Fittings Co., Barberton, O. . . I . . .
Plume & Atwood Mfg. Co., Waterbury, Conn. B . . S H
Plumwood. See Plume & Atwood Mfg. Co.
Plymouth. See Vester Sons, Alfred.
Products Machine Co., Bridgeport, Conn. . . . . B . . . .
Reading Brass Co., 141 Schiller, Reading, Pa. B I . . . .
Ribaysen Mfg. Co., J., 952 W. Lake, Chicago, Ill. B . . . .
Rodale Mfg. Co., 200 Hudson, New York. . . . B . . . H
Sandow Tool Co., 1440 Bway, New York, N. Y. . . . S . .
Scovill Mfg. Co., Waterbury, Conn. . . . . B I . . .
Simpalite. See Sprecher Mfg. Co., P. W.
Simplex. See Plume & Atwood Mfg. Co.
Springfast. See Plume & Atwood Mfg. Co.
Square-G. See Grabler Mfg. Co.
Standard Snap-Lite Corp., 504 Jackson Ave., Long Island City, N. Y. . . . . S . .
Standard Metal Spinning Co., 128 Mott, New York, N. Y. . . . . B . . . . .
Star. See Perfecilite Co.
Star. See Steel City Elec. Co.
Steel City Elec. Co., Pittsburgh, Pa. . . . . I . . .
Steele & Johnson Mfg. Co., Waterbury, Conn. B . . S . .
Stembridge & Brandt, 29 S. Clinton, Chicago, Ill. (White Metal.) . . . . . B . . . .
Sterling Spinning & Stamping Wks., 476 Broome, New York, N. Y.
T. & B. See Thomas & Betts Co.
Thomas & Betts Co., 63 Vesey, New York. . . . . I . . .
Uno. See Bryant Elec. Co., also Crouse-Hinds. also General Elec. Co., also Hart & Hegeman Mfg. Co., also Pass & Seymour.
United. See L & K Mfg. Co.

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United Metal Spinning Co., 440 Adelphi, Brooklyn, N. Y. . . . . B . . . . .
Vester, Sons, Alfred, 5 Mason, Providence, R. I. B . . . . .
Victor. See Plume & Atwood Mfg. Co.
Virden, Div. of Gill-Virden Co., 6108 Longfellow Ave., Cleveland, O. . . . . B . . . . .
Walden Tool & Metal Mfg. Co., New Haven Conn. . . . . .
Wameco. See Waterbury Metal Wares Co.
Waterbury Metal Wares Co., Waterbury, Conn. . . . S . .
Weber Brass Co., Whitney Power Block, Cleveland, O. . . . . B . . .
White Diamond. See White Mfg. Co., J. H.
White Mfg. Co., J. H., 79 Madison Ave., New York, N. Y. . . . . B . . S . .
Wilhite Machine Wks., 1245 S. Hope, Los Angeles, Cal. . . . . B . . . . .

FLASHERS, Sign
Motor Flashers, Thermal Flashers, Flashing Sockets and Plugs.
Ajax. See Reynolds Spring Co.
A. & W. See General Outdoor Adv. Co.
Angelus. See Electric Sign Flasher Corp.
Betts, Inc., James H., 1393 Sedgwick Ave., New York. (Motor Flashers, Thermal Flashers, Flashing Sockets and Plugs.)
Betts & Betts Corp., 645 W. 43rd, New York, N. Y. (Motor Flashers.) (Thermal Flashers.) Flashing Plugs.)
California Sign Flasher Co., 250 Guttenberg, San Francisco, Cal.
Commercial Elec. Co., 1203 E. Grant, Portland, Ore.
Cramblet Engineering Div. of Time-O-Stat Controls Co., 286 Milwaukee, Milwaukee, Wis.
Diamond. See General Appliance Corp.
Dominic. See Kala-Flasher Co.
Eagle Elec. Mfg. Co., 79 Hall, Brooklyn, N. Y.
Electric Signal Corp., 406 Fourth Ave., Seattle, Wash.
Electric Sign Flasher Corp., 1826 W. 9th, Los Angeles, Cal.
Figuregram. See Reynolds Electric Co.
Flash O-Lite. See Betts, Inc., James H.
Flip-Flop. See Betts, Inc., James H.
Gem Engineering Co., Hempstead, N. Y.
Gacor. See General Appliance Corp.
General Appliance Corp., 120 8th, San Francisco, Cal. (Flasher Button.)
General Controler Co., 200 E. First, Dayton, O.
Grazier Elec'l Products Co., Johnstown, Pa.
Harrington-Seaberg Corp., 1708 Third Ave., Moline, Ill.
Horni Signal Mfg. Co., 516 Greenwich, New York, N. Y.
Jimbetts. See Betts, Inc., James H.
Kala-Flasher Co., 344 N. Church, Kalamazoo, Mich.
Killark. See Betts & Betts Corp.
Kontroler. See General Controler Co.
Mercury. See Betts, Inc., James H.
Opalume Sign System, Battle Creek, Mich.
Phelps Elec. Co., 29 S. Clinton, Chicago, Ill. (Motorless)
Phoenix Products Co., Phoenix, N. Y.
Presto Products Co., 64 University Place, New York, N. Y. (Sockets and Plugs.)
Reco. See Reynolds Elec. Co.
Reynolds Elec. Co., 2650 W. Congress, Chicago, Ill.
Reynolds Spring Co., Jackson, Mich.
Rodale Mfg. Co., 200 Hudson, New York, N. Y.
Ryan. See Phoenix Products Co.
Skedoodle. See Phelps Elec. Co.
Sokit. See Betts, Inc., James H.
Thermo-Wynk. See Betts & Betts Corp.
Vacu. See Betts & Betts Corp.
Veebar. See Betts, Inc., James H.
Way, Eugene W., Seattle, Wash.
Wood Electric Co., C. D., 565 Broadway, New York N. Y.
Woodwin. See Wood Elec. Co., C. D.
Wynk-A-Lyte. See Betts & Betts Corp.
FLASHLIGHT LENSES. See Lenses.
FLEXIBLE ARMS. See Tubing, Flexible Metallic.
FLEXIBLE LEADS, Commutator Brush. See Brushes, Commutator.

FLEXIBLE SHAFT MACHINES
(For shafting. See Tubing, Flexible Metallic.)
Strand & Co., N. A., 5001 N. Lincoln, Chicago, Ill.
FLUTING MACHINES. See Pleating Machines.

FORGINGS, Non-Ferrous
Scovill Mfg. Co., Waterbury, Conn.

FORMS, Coil Winding
Armature Coil Equipment Co., 2415 Forestdale Ave., Cleveland, O.
Comstock Mfg. Co., Wilkes-Barre, Pa.
Master. See Armature Coil Equipment Co.

FORMS, Wire
Forms and Frames for Shade Holders and Shades: Bending, Welding, Forming.
American Specialty Mfg. Co., 165 Holland Ave., Bridgeport, Conn.
Arrow Wire Frame Corp., 344 E 23rd, New York, N. Y.
Blake & Johnson Co., 1497 Thomaston Ave., Waterville, Conn
Central Wire Frame Co., 154 E. 23rd, New York, N. Y. (Complete with socket, cord and plug.)
Chelsea Wire Wks., 675 Hudson, New York, N. Y.
Clark Metal Products Inc., 490 Hancock Ave., Bridgeport, Conn.
City Wire Frame Co., 2025 S. Michigan Ave., Chicago.
Electro Weld Co., 70 Munroe, Lynn, Mass.
Fischer Spring Co., Chas., 238 Kent Ave., Brooklyn, N. Y.
Grammes & Sons, Inc., L. F., Allentown, Pa.
Hubbard Spring Co., M. D., Pontiac, Mich.
Hunter Pressed Steel Co., Lansdale, Pa.
Jeschke Wire Specialty Wks., Crawfordsville, Ind.
Krischer's Mfg. Co., 255 Calyer, Brooklyn, N. Y.
Manhattan Wire Products Co., 398 First Ave., New York.
Murray Hill Wire Frame Co., 314 E. 32nd, New York, N. Y.
Roebling's Sons Co., John A., Trenton, N. J.

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Sensitive fire alarm mechanisms require insulation that will not fail

The sensitive electrical mechanism of a fire alarm box must be ready to function at all times. Insulation parts must not fail, even when temperatures drop to 40 below zero, or jump to 100 above. To provide this unfailing performance "Gamewell" uses Bakelite Materials.

The entire fire alarm movement is assembled in a deep, seamless box, with a hinged cover, both being formed of red Bakelite Molded. The threaded brass inserts required for holding the movement in place are firmly embedded when the box is molded. Trade-mark and lettering in high relief on the cover are also formed in the mold.

Brown Bakelite Molded is used for the assembly board, which is completed in a single molding operation, with finished bosses, holes, channels and recesses. It, too, has a number of embedded metal inserts. Dial, spools, lever, knobs, terminal cover and other smaller parts are also of Bakelite Molded. Additional parts are of Bakelite Laminated, and others of brass and bronze are protected with Bakelite Lacquer.

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Intimate knowledge of thousands of varied applications of Bakelite Materials combined with eighteen years' experience in the development of phenol resinoids for electrical uses provides a valuable background for the cooperation offered by our engineers and research laboratories. Write for Booklet 52M, "Bakelite Molded."

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FORMS, Wire—Continued
Steinen & Co., 297 Washington, Newark, N. J.
Watral & Sons, 133 E. 16th, New York, N. Y.
Young Industries, Inc., L. A., Detroit, Mich.

FRAMES, Wire. See Forms, Wire.
FRICTION TAPE. See Tape, Rubber and Friction.
FRINGE, Chandelier. See Crystals, Chandelier.

FUSE CLIPS

Sherman Mfg. Co., H. B., Battle Creek, Mich.
Waterbury Brass Goods Co., Waterbury, Conn.

FUSE TESTERS. See Testers, Fuse and Circuit.

FUSES AND FUSE WIRE

KEY

Cartridge ..... See C
Plug ..... See P
Non-Refillable ..... See N
Refillable ..... See R
Open Link ..... See O
Fuse Wire ..... See O

Acme Elec. & Mfg. Co., Canal & Hamilton Ave., Trenton, N. J. .. P . . . . .
Arkless. See Economy Fuse Mfg. Co.
Arrow Electric Div. of Arrow-Hart & Hegeman Elec. Co., Hartford, Conn. .. P N . . .
Automatic Elec. Iron & Fuse Co., 215 S. American, Philadelphia, Pa. .. P . . . . .
Buss. See Bussman Mfg. Co.
Bussmann Mfg. Co., University & Jefferson Ave., St. Louis ..... C P N R O
Chase-Shawmut Co., Newburyport, Mass... C P N R O
Clearsite. See Economy Fuse & Mfg. Co.
Clear-Top. See Trico Fuse Mfg. Co.
Colortop. See Trico Fuse Mfg. Co.
Colt's Patent Fire Arms Mfg. Co., Hartford, Conn. (Automobile) ..... C . . N R . .
Cote Bros. Mfg. Co., 182 W. Lake, Chicago C P . . R . .
Crystal. See Royal Elec. Co.
Daum Fuse & Elec. Mfg. Co., 1157 Hodgkiss, Pittsburgh ..... C . . . . R . .
D. & W. See Graybar Electric Co.
Economy Fuse & Mfg. Co., 2717 Greenview Ave., Chicago, Ill. ..... C P N R . .
Eco. See Economy Fuse & Mfg. Co.
Electric Fuseguard Co., Charlottesville, Va.. C P N R . .
Elliott Electric Co., Shreveport, La. .. . .
Gem. See Chicago-Jefferson Fuse & Electric
General Elec. Co., Merchandise Dept., Bridgeport, Conn. ..... C P N R . .
Graybar Electric Co., Graybar Bldg., Lexington Ave. and 43rd St., New York, N. Y. C . . . . . .
Great Western Fuse Co., 415 Lexington Ave., New York, N. Y. ..... C . . . . R . .
H. & H. See Hart & Hegeman.
Hart & Hegeman, Div. of Arrow-Hart & Hegeman Elec. Co., Hartford, Conn. .. P . . R . .
Hudson Wire Co., Ossining, N. Y. .. . . . . O
Kantark. See Trico Fuse Mfg. Co.
Kirkman Engrg. Co., 1 Dominick St., New York, N. Y. ..... C P N . . O
Littelfuse Laboratories, 1772 Wilson Ave., Chicago, Ill. (Low Capacity, Glass Enclosed, .025 to 2 Amp.) .. . .
Monarch Fuse Co., 116 E. First, Jamestown, N. Y. ..... C . . N R . .
National. See Economy Fuse & Mfg. Co.
Noark. See Colt's Patent Fire Arms Mfg. Co.
Pierce Renewable Fuses, Inc., 752 Main, Buffalo, N. Y ..... C P . . R . .
Platt Bros. & Co., Waterbury, Conn. .. . . . . O
Powell, F. W., 119 W. Ohio, Pittsburgh. . . P . . R . .
Ree-Nu-It Elec. Co., New Bedford, Mass.. C P . . R . .
Rochester Re-Fill Fuse Co., 402 Cottage, Rochester, N. Y. ..... C . . . R . .
Royal Elec. Co., Chelsea Station, Boston. . . P N . . . .
Shawmut. See Chase-Shawmut Co.
Simplicity. See Cote Bros. Mfg. Co.
Six-in-One. See Industrial Engrg. Co.
Star Fuse Co., 235 Canal, New York, N. Y. C P . . R . .
Trico Fuse Mfg. Co., 1001 McKinley Ave., Milwaukee ..... C P N R . .
Union. See Chicago-Jefferson Fuse & Electric

GALVANIZING

Cattie & Bros., Joseph P., Gaul and Letterly Sts., Philadelphia, Pa.

GALVANOMETERS. See Instruments, Laboratory Standard.

GAS, Inert

Helium Co., Louisville, Ky.
Palstine Industrial Co., 111 Fifth Ave., New York, N. Y.
Weber, Alfred, 5 Union Square, New York, N. Y.

GAS SIGN ELECTRODES. See Electrodes for Gas Signs

GASKETS, Rubber

Gutta Percha & Rubber Mfg. Co., 15 Park Row, New York.
Canfield Rubber Co., Bridgeport, Conn.

GAUZE BRUSHES, Wire. See Brushes, Commutator.
GEARS, Fibre. See Gears and Pinions, Composition.

GEARS (Speed Changing Units)

Cleveland Worm & Gear Co., Cleveland, Ohio.
Cullman Wheel Co., 1346 Altgild, Chicago, Ill.
De Laval Steam Turbine Co., Trenton, N. J.
Falk Corp., Milwaukee, Wis.
Farrell-Birmingham Co., 344 Vielcan, Buffalo, N. Y.
Foote Bros. Gear & Machine Co., 215 N. Curtis, Chicago, Ill.
Gears & Forgings, Inc., Cleveland, Ohio.
Grant Gear Works, Boston, Mass.
James Mfg. Co., D. O., Chicago, Ill.
Janette Mfg. Co., 556 W. Monroe, Chicago, Ill.
Jones Pdy. & Machine Co., W. A., Chicago, Ill.
Lipe, W. C., Syracuse, N. Y.
Nuttall Wks., of Westinghouse Elec. & Mfg. Co., McCandless Ave. & Harrison St., Pittsburgh, Pa.
Palmer-Bee Co., Detroit, Mich.
Ohio Gear Co., 1333 E. 179th, Cleveland, Ohio.
Perkins Machine & Gear Co., 125 Circuit Ave., Springfield, Mass.
Philadelphia Gear Works, Richmond and Tioga Sts., Philadelphia, Pa.
Smith, Winfield H., Springville, N. Y.

GEARS, Worm

Albaugh-Dover Mfg. Co., Chicago, Ill.
Cleveland Worm & Gear Co., Cleveland, Ohio.
Colburn Gear & Mfg. Co. (Norfolk Downs), Quincy, Mass.
Ohio Gear Co., 1333 E. 179th, Cleveland, Ohio.
Philadelphia Gear Works, Richmond and Tioga Sts., Philadelphia, Pa.

GEARS AND PINIONS, Composition

Chicago Stock Gear Wks., 105 S. Jefferson, Chicago, Ill.
Continental-Diamond Fibre Co., Bridgeport, Pa.
Delaware Hard Fibre Co., Box 790 M, Wilmington, Del.
Fabroil. See General Elec. Co.
Foote Bros. Gear & Machine Co., 215 N. Curtis, Chicago.
Franklin Fibre Specialty Co., Wilmington, Del.
General Electric Co., Schenectady, N. Y.
Medart Co., St. Louis, Mo.

Micarta. See Westinghouse Elec. & Mfg. Co.
National Vulcanized Fibre Co., Wilmington, Del.
Ohio Gear Co., 1333 E. 179th St., Cleveland, Ohio.
Perkins Machine & Gear Co., 125 Circuit Ave., Springfield, Mass.
Stahl Gear Co., 1390 E. 40th, Cleveland, Ohio.
Stranahan Gear Co., Philadelphia, Pa.
Textoil. See General Electric Co.
Textolite. See General Electric Co.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

GEARS AND PINIONS, Iron and Steel

Earle Gear & Machine Co., Wayne Junction, Philadelphia.
Falk Corp., Milwaukee, Wis.
Gears & Forgings, Inc., Cleveland, Ohio.
Grant Gear Works, Boston, Mass.
James Mfg. Co., D. O., Chicago, Ill.
Medart Co., St. Louis, Mo.
Meisel Bros. Mfg. Co., 944 Dorchester Ave., Boston, Mass.
Ohio Gear Co., 1333 E. 179th St., Cleveland, Ohio.
Perkins Machine & Gear Co., 120 Circuit Ave., Springfield, Mass.
Permag. See Perkins Machine.
Tool Steel Gear & Pinion Co., Cincinnati, Ohio.

GEARS AND PINIONS, Rawhide

Chicago Rawhide Mfg. Co., 1313 Elston Ave., Chicago, Ill.
Gerdes & Co., 50 Church, New York, N. Y.
Syracuse Rawhide Mfg. Co., Syracuse, N. Y.
Western Rawhide & Belting Co., Milwaukee, Wis.

GENERATORS, Electroplating. See Plating Generators.
GLASS BULBS. See Bulbs, Glass.
GLASS CANDLES. See Candles, Fixture.
GLASS LETTERS. See Letters, Sign.

GLASS for Electrical Purposes

Corning Glass Wks., Corning, N. Y.
Pyrex. See Corning Glass Wks.

GLASSWARE

Alba. See Macbeth-Evans Glass Co.
Amazon. See Gleason-Tiebout Glass Co.
Amelites. See Consolidated Lamp & Glass Co.
Apollo. See Gillinder Bros., Inc.
Ardmore. See Jeannette Shade & Novelty Co.
Aurene. See Corning Glass Co.
Aurora. See Consolidated Lamp & Glass Co.
Bayley Sons, 105 Vanderveer, Brooklyn, N. Y.
Beaumont Co., Morgantown, W. Va.
Bellova. See McFaddin & Co., H. G.
Blanco. See Gleason-Tiebout Glass Co.
Beryllite. See Plaut & Co., L.
Bostock, Rhodes & Co., 11 N. Moore, New York, N. Y
Canula. See Gleason-Tiebout Glass Co.
Carara. See Gleason-Tiebout Glass Co.
Celestialite. See Gleason-Tiebout Glass Co.
Chesler & Sons Co., J., 45 Varick Ave., Brooklyn, N. Y
Clearcut. See Ivanhoe Division of Miller Co.
Colcite. See Corning Glass Co.
Consolidated Lamp & Glass Co., Coraopolis, Pa.
Cora. See Consolidated Lamp & Glass Co.
Cora-Lites. See Consolidated Lamp & Glass Co.
Corning Glass Co., Corning, N. Y.
Cremax. See Macbeth-Evans Glass Co.
Crystal. See Phoenix Glass Co.
Daylite. See Wells Glass Co.
Delica-White. See Kopp Glass, Inc.
Druid. See Ivanhoe Division of Miller Co.
Eagle Mfg. Co., Wellsburg, W. Va.
Emeralite. See McFaddin, H. G.
Equalite. See Bayley & Sons.
Erskine Glass & Mfg. Co., Wellsburg, W. Va.
Federal Light & Lens Corp., Star City, W. Va.
Florentine. See Gleason-Tiebout Glass Co.
Genco. See Ivanhoe Division of Miller Co.
Gillinder Bros., Inc., Port Jervis, N. Y.
Gillinder & Sons, Inc., Philadelphia, Pa.
Gleason-Tiebout Glass Co., 99 Commercial, Brooklyn, N. Y
Gletteco. See Gleason-Tiebout Glass Co.
Havana. See Kopp Glass, Inc.
Hocking Glass Co., Lancaster, O.
Holophane Co., 342 Madison Ave., New York, N. Y.
Imperial Glass Co., Bellaire, O.
Inland Glass Works, Chicago, Ill.
Ivanhoe Division of Miller Co., Cleveland, Ohio.
Ivory. See Phoenix Glass Co.
Ivre. See Ivanhoe Division of Miller Co.
Jeannette Shade & Novelty Co., Jeannette, Pa.
Jefferson Glass Co., Follansbee, W. Va.
Kopp Glass, Inc., Swissvale, Pa.
Lumina. See Hocking Glass Co.
Luminite. See Macbeth-Evans Glass Co.
Macbeth-Evans Glass Co., Dept. G, Eastern Division. Charleroi, Pa.
Magnolia. See Phoenix Glass Co.
McFaddin & Co., H. G., 38 Warren, New York, N. Y.
MelHite. See Gillinder & Sons, Inc.
Micro. See Gillinder & Sons, Inc.
Miller Co., Meriden, Conn.
Monax. See Macbeth-Evans Glass Co.
Moonstone. See Jefferson Glass Co.
N. B. G. See Gillinder & Sons, Inc.
N. U. Glass. See Gillinder & Sons, Inc.
Nebulite. See Gillinder & Sons, Inc.
Nemalite. See Gillinder & Sons, Inc.
Nitro-Glas. See Jefferson Glass Co.
Nuart. See Imperial Glass Co.
Nulite. See Consolidated Lamp & Glass Co.
Nutralux. See Kopp Glass, Inc.
Opalux. See Gleason-Tiebout Glass Co.
Opola. See Inland Glass Co.
Oplex. See Perfection Glass Co.
Pastelle. See Consolidated Lamp & Glass Co.
Pearltone. See Inland Glass Co.
Perfection Glass Co., Star City, W. Va.
Persian. See Gillinder & Sons, Inc.
Phoenix Glass Co., Monaca, Pa.
Pilabrasgo. See Kopp Glass, Inc.
Pittsburgh Cut Glass Co., Monaca, Pa.
Plaut & Co., L., 432 E. 23rd, New York, N. Y.
Poly-Case. See Gleason-Tiebout Glass Co.
Prestepal. See Gleason-Tiebout Glass Co.
Radiant. See Phoenix Glass Co.
Regent. See Ivanhoe Division of Miller Co.
Rezelle. See Ivanhoe Division of Miller Co.
Rosedora. See Consolidated Lamp & Glass Co.
Shade-O-Tone. See Consolidated Lamp & Glass Co.
Snow-White. See Inland Glass Works.
Soloman & Son, Inc., L., 199 Wooster, New York, N. Y.
Star Glass Co., Star City, W. Va.
Sudan. See Ivanhoe Division of Miller Co.

INSTRUMENTS

Megohmers — Ohmers — Tachometers, Tachoscopes, Speed Indicators, Phase Sequence Indicators, etc.

Write for complete Bulletin BC

HERMAN H. STICHT & CO.
21 Park Row, New York, N. Y.

Thebian. See Macbeth-Evans Glass Co.
Translux. See Kopp Glass, Inc.
Trojan. See Ivanhoe Div. of Miller Co.
United Novelty Glass Mfg. Co., 121 Prince, New York, N. Y.
Utopia. See Kopp Glass, Inc.
Velaria. See Ivanhoe Division of Miller Co.
Vineland Flint Glass Wks., Vineland, N. J.
Wells Glass Co., Kokomo, Ind.
Williamsburg Flint Glass Co., 290 Broadway, New York.
Yural. See Ivanhoe Division of Miller Co.
Zanesville Mould Co., Zanesville, O.

GONGS, Unmounted Shells

Bevin Bros. Mfg. Co., East Hampton, Conn.
Bridgeport Brass Co., 774 E. Main, Bridgeport, Conn.
Chase Brass & Copper Co., Waterbury, Conn.
East Hampton Bell Co., East Hampton, Conn.
Gong Bell Mfg. Co., East Hampton, Conn.
Hill Brass Co., M. N., East Hampton, Conn.
Liberty Bell Mfg. Co., Minerva, O.
Reiter, G. C., Canton, O.

GRAPHITE BEARINGS. See Bearings, Oil-less.
GRID LEAKS. See Radio Circuit Components.
GRIDS, Resistance. See Units, Rods and Grids.
GRILL CLOTH. See Cloth, Untreated.
GRINDERS, Commutator. See Tools, Commutator Truing.
GROMMETS. See Eyelets.
GROUND LOCATORS. See Instruments, Portable and Switchboard; also Testers, Coil.
GROWLERS, Armature. See Testers, Coil.

HANDLES, Wood; For Switches or Sad Irons

Allen, Chas. E., Pequabuck, Conn.
American Enamel Co., 20 Neville, Providence, R. I.
Bogert & Hopper, 225 Varick, New York, N. Y.
Estes & Son, E. B., 5844 Grand Central Terminal Bldg., New York, N. Y.
Fitchburg Enamel Co., Fitchburg, Mass.
Flanders Hardware Co., North Weare, N. H.
Fuller, J. J. Westfield, Mass.
Narragansett Mach. Co., Pawtucket, R. I.
National Wood Process, New Bedford, Mass.
Novelty Turning Co., Norway, Me.
Ober Mfg. Co., Chagrin Falls, O.
Osborn Mfg. Co., 5401 Hamilton Ave., Cleveland, O
Piqua Handle & Mfg. Co., Piqua, Ohio.
Royal Enamel Co., Fitchburg, Mass.
Schutz Bros., 152 Chambers, New York, N. Y.
Stiles & Co., H. A., 174 Portland, Boston, Mass.
Stratton Mfg. Co., Stratton, Maine.
Sun Enamel Wks., Leominster, Mass.

HOLDERS, Brush. See Brushes, Commutator.
HOT WIRE METERS. See Instruments, Portable and Switchboard.
IMPREGNATING COMPOUNDS. See Wax and Compounds.
IMPREGNATING, VACUUM. See Ovens, Industrial.
INCANDESCENT LAMP BULBS (Unfinished). See Bulbs, Glass.
INCANDESCENT LAMP FILAMENTS. See Filaments, Incandescent Lamp.

INDICATORS, Operation

Operation and Cost Indicators for Manager's Office.
Bristol Co., Waterbury, Conn. (Elapsed Time Recorder.)
Production Meter Co., 1315 S. Wabash Ave., Chicago, Ill

INDUCTION COILS. See Coils, Finished.
INSTRUMENT, Jewels. See Jewels.
INSTRUMENTS, Laboratory Standard. See Instruments, Laboratory Standard.
INSTRUMENTS, Portable Testing. See Instruments, Portable and Switchboard; also Instruments, Pocket.

INSTRUMENTS, Laboratory Standard

Beck Bros., 3640 N. Second, Philadelphia, Pa.
Biddle, James G., 1211 Arch, Philadelphia, Pa.
Burt, R. C., 327 Michigan Ave., Pasadena, Cal. (Oscilloscopes.)
Cambridge Instrument Co., Grand Central Terminal Bldg., New York, N. Y.
Chicago Apparatus Co., 1735 N. Ashland Ave., Chicago, Ill
Eppley Laboratory, Newport, R. I. (Standard Cells.)
Fahy. See Rubicon Co.
General Electric Co., Schenectady, N. Y.
Gray Instrument Co., 64½ W. Johnson, Philadelphia, Pa.
Hickok Elec'l Instrument Co., 10514 Dupont, Cleveland, O
Jagabi. See Biddle, James G.
Jewell Elec. Instrument Co., 1650 Walnut, Chicago, Ill.
Kasson. See Rawson Elec'l Instrument Co.
Kelvin. See Leeds & Northrup Co.
Kohlrausch. See Leeds & Northrup Co.
Leeds & Northrup Co., 4901 Stenton Ave., Philadelphia, Pa
Milvay. See Chicago Apparatus Co.
Osiac. See Westinghouse Electric & Mfg. Co.
Radio Elec'l Wks., 50 W. 22nd, New York, N. Y.
Rawson Elec'l Instrument Co., Cambridge, Mass.
Roller-Smith Co., 239 Broadway, New York, N. Y
Rubicon Co., 29 N. Sixth, Philadelphia Pa. (Wheatstone Bridges, Galvanometers, Inductance Condensers, Potentiometers, Resistance Boxes, Permeameters.)
Stimpler. See Leeds & Northrup Co.
Strobatchy. See Radio Elec'l Wks.
Stromberg Electric Co., 223 W. Erie, Chicago, Ill.
Thompson-Levering Co., 351 N. 57th St., Philadelphia, Pa
Unipivot. See Rawson Elec'l Inst. Co.
Vreeland Apparatus Co., 140 Cedar, New York, N. Y. (Sine Wave Oscillators.)
Westinghouse Electric & Mfg. Co., Newark, N. J.
Weston Elect. Instrument Corp., 583 Frelinghuysen Ave., Newark, N. J.

INSTRUMENTS, Pocket

Advance. See Eldredge Elec'l Corp.
Adbro Mfg. Co., 927 French, Pittsburgh, Pa.
Eclipse. See Eldredge Elec'l Corp.
Eldredge Elec'l Corp., 3 P. O. Sq., Springfield, Mass.
Ideal Instrument Co., Penacook, N. H.
Jewell Elec. Instrument Co., 1650 Walnut, Chicago, Ill.
Kellogg Switchboard & Supply Co., 1066 W. Adams, Chicago, Ill.
Lundquist Tool & Mfg. Co., Worcester, Mass.
Milavolt. See Adbro Mfg. Co.
Readrite Meter Works, 7 College Ave., Bluffton, Ohio.
Roller-Smith Co., 239 Broadway, New York, N. Y.
Shire Elec. Products Co., Marquette Bldg., Detroit, Mich
Sholder-Excel Mfg. Co., Clyde, Ohio.
Square D Company, Detroit, Mich.
Sterling Mfg. Co., 2831 Prospect Ave., Cleveland, Ohio.
Weston Elect. Instrument Corp., 583 Frelinghuysen Ave., Newark, N. J.
Wigginton. See Square D Company.
Yankee. See Lundquist Tool Mfg. Co.

INSTRUMENTS, Portable and Switchboard

This heading includes all standard, portable and switchboard types, measuring and testing instruments—ammeters, voltmeters, wattmeters, ohmmeters, cable testers and fault-finders.

See Also Instruments, Pocket; Also Instruments, Laboratory Standard.

Beck Bros., 421 Sedgley Ave., Philadelphia, Pa.
Beede Instrument Co., Penacook, N. H.
Biddle, James G., 1211 Arch, Philadelphia, Pa.
Brown Instrument Co., Wayne and Windrim Sts., Philadelphia, Pa.

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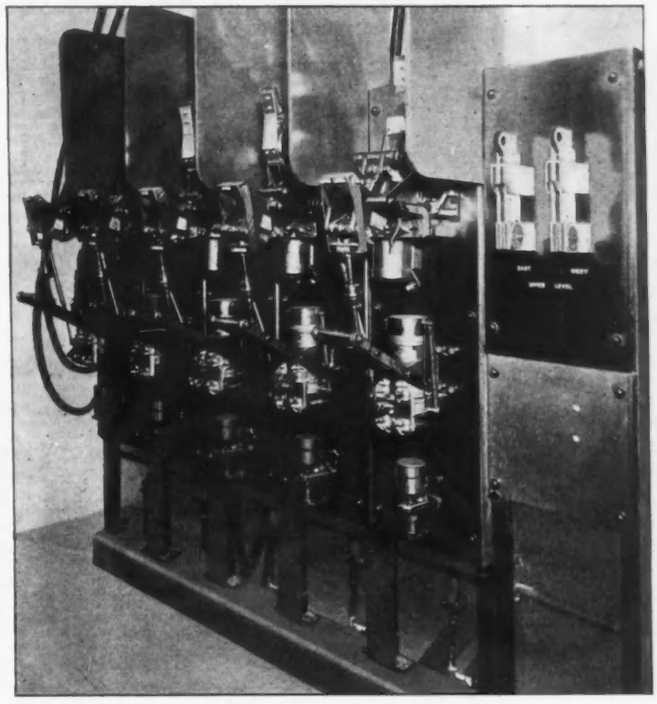

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INSTRUMENTS, Portable and Switchboard—Continued
Cambridge Instrument Co., Grand Central Terminal, New York, N. Y.
Dongan Electric Mfg. Co., 2985 Franklin, Detroit, Mich
Eastern Specialty Co., 3551 N. Fifth, Philadelphia, Pa
Electric Mfg. Co., 966 Mission, San Francisco, Cal.
Esterline-Angus Co., Speedway, Indianapolis, Ind.
Fidelity Electric Co., Lancaster, Pa.
Fisher Cable Test Sets. See Leeds & Northrup.
Fore Elect. Mfg. Co., 5255 Wabada Ave., St. Louis, Mo.
Freyn Engrg. Co., 310 S. Michigan Ave., Chicago, Ill.
General Electric Co., Schenectady, N. Y.
General Radio Co., Cambridge, Mass.
Gray Instrument Co., 64½ W. Johnson, Philadelphia, Pa
Ground-Ohmer. See Sticht & Co.
Hamilton-Sangamo Corp., Springfield, Ill.
Handy. See Weinberg & Co.
Hickok Elect. Inst. Co., 10514 Dupont, Cleveland, O.
Hoyt Elect. Inst. Wks., 857 Boylston, Boston, Mass.
I T L. See Illinois Testing Laboratories.
Jewell Elec. Instrument Co., 1650 Walnut, Chicago, Ill.
Leeds & Northrup Co., 4901 Stenton Ave., Philadelphia, Pa
Master. See Jewell Elect. Instrument Co.
M. D. C. See Metropolitan Devices Corp.
Megger Testing Sets. See Biddle.
Metropolitan Devices Corp., 1250 Atlantic Ave., Brooklyn
Multi-Volt Trouble Finder. See Welford, Jr., Geo. W.
Nagel Elect. Co., W. G., 23 St. Clair, Toledo, Ohio.
Norton Elect. Inst. Co., 81 Hilliard, Manchester, Conn
Paneltest Meters. See Beede Instrument Co.
Peerless Meters. See Thompson-Levering Co.
Pier Equipment Mfg. Co., Benton Harbor, Mich.
Pin-Jack. See Weston Elec'l Instrument Co.
Price Hollister Co., Rockford, Ill.
Queen. See Gray Instrument Co.
Radio Electric Works, 150 West 22nd St., New York, N. Y.
Rawson Elect. Inst. Co., Cambridge, Mass.
Roller-Smith Co. 120 Broadway, New York, N. Y.
Shortfinder. See Eisemann Shortfinder Co.
Standee. See Sticht Co., H. H.
States Co., Hartford, Conn.
Sterling Mfg. Co., 2831 Prospect Ave., Cleveland, Ohio.
Sticht & Co., H. H., 21 Park Row, New York, N. Y.
Tanner Engrg. Co., Rawson St. and Nelson Ave., Long Island City, N. Y.
Test-A-Bat. See Beede Instrument Co.
Thompson-Levering Co., 351 N. 57th, Philadelphia, Pa
Thomson. See General Electric Co.
Triplex Meters. See Roller-Smith Co.
3 in 1. See Sticht & Co., H. H.
Two-in-One. See Stitcht Co., Herman H.
United States Gauge Co., 44 Beaver, New York, N. Y.
Utility. See Esterline-Angus Co.
Westinghouse Electric & Mfg. Co., Newark, N. J.
Weston Elect. Instrument Corp., 582 Frelinghuysen Ave., Newark, N. J.

INSULATION (Insulating) (Insulators)
Beads. See Beads, Insulating.
Canopy. See Insulators, Canopy.
Cloth. See Cloth & Paper.
Composition. See Molded Insulation
Compound. See Wax and Comp.
Fibre. See Fibre.
Lava. See Cores, Resistance Coil.
Marble. See Slate
Mica. See Mica.
Molded. See Molded Insulation.
Paint. See Paint, Varnish, Laquer.
Paper. See Cloth and Paper Insulating.
Phenolic. See Fibre, Phenol. Also Molded Insulation.
Porcelain. See Porcelain.
Rod. See Rubber, Hard.
Rubber. See Rubber, Hard.
Sealing Wax. See Wax and Compounds.
Slate. See Slate.
Soapstone. See Soapstone.
Tubing. See Tubing, Varnished Fabrics.
Varnish. See Paint and Varnish.
Wax. See Wax and Compounds.

INSULATING MACHINES, WIRE. See Wire Manufacturing Machines.
INSULATING TUBING. See Tubing, Varnished Fabric; also Tubing, Rubber.

INSULATION CUTTERS
Artos Engrg. Co., 115 Brown, Milwaukee, Wis.

INSULATION MIXERS
Baker Perkins Co. Saginaw, Mich.

INSULATION SHEARS. See Shears, Insulation.
INSULATION STRAINING MACHINES. See Wire Manufacturing Machines.
INSULATION TESTERS. See Instruments, Laboratory Standard.

INSULATORS, Canopy
Continental-Diamond Fibre Co., Bridgeport, Pa.
Franklin Fibre Specialty Co., Wilmington, Del.
General Electric Co., Schenectady, N. Y.
Knu. See Stanley, Arthur F.
Macallen Co., Boston 27, Mass.
Stanley, Arthur F. 150 Varick, New York, N. Y.
Wilmington Fibre Specialty Co., Wilmington, Del.

IRON CASTINGS. See Castings, Gray Iron.
IRONS, Soldering. See Soldering Irons.
JACKS, Armature. See Lifts, Armature.
JACKS, Radio. See Radio Receiver Parts.

JARS, Battery, Glass
For Composition Jars. See Molded Insulation; also Rubber.
Corning Glass Co., Corning, N. Y.
Cumberland Glass Mfg. Co., Bridgeton, N. J.
Gaynor Glass Works, Salem, N. J.
Gillinder & Sons, Inc., Philadelphia, Pa.
Hazel-Atlas Glass Co., Wheeling, W. Va.
Macbeth-Evans Glass Co., Dept. G, Eastern Division Charleroi, Pa.
Rodefer Glass Co., Bellaire, O.

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COOK POTTERY CO.,
Trenton, N.J.

Sneath Glass Co., Hartford City, Ind.
United States Glass Co., 9th & Bingham, Pittsburgh, Pa.

JEWELS, Instrument Bearing
Bird, Richard H., Waltham, Mass.
Deknatel & Sons, J. A., Queens Village, N. Y.
Eastern Specialty Co., 3551 N. Fifth, Philadelphia, Pa.
Fisher, Thomas E., Penacook N. H.
Gatti, Inc., Aurele M., Liberty St. & Fairmount Ave., Trenton, N. J.
Moser Jewel Co., Perth Amboy, N. J.
Mildrum Jewel Co., East Berlin, Conn.
Sapphire Products Co., 51 Chambers, New York, N. Y
Universal. See Oefinger, J. L.
Wennstrom's Sons Co., John, Suffern, N. Y.
Worley Jewel Co., John, Waltham, Mass.

JOINTS, Fixture Insulating
Appleton Elec. Co., 1703 Wellington Ave., Chicago, Ill.
Macallen Co., Boston 27, Mass.
Sandow Tool Co., 1440 Broadway, New York, N. Y.
Sprecher Mfg. Co., P. W., 3220 North Ave., Milwaukee.
White Co., O. C., 15 Hermon, Worcester, Mass
Wittenberg Bros., 60 Shipman, Newark, N. J.

LABORATORY (Laboratories.)
Ovens. See Ovens, Industrial & Laboratory.
Rheostats. See Rheostats.
Testing. See Testing.

LABORATORY STANDARD INSTRUMENTS. See Instruments, Laboratory Standard.
LACQUER, ARMATURE. See Paint, Varnish and Lacquer. Metal. See Paint, Varnish and Lacquer.
LAMINATIONS. See Discs, Armature.
LAMP BASES. See Bases, Reading Lamp.
LAMP BULBS (Unfinished). See Bulbs, Glass.
LAMP FILAMENTS. See Filaments, Incandescent Lamp.
LAMP LEAD-IN WELDS. See Filaments, Incandescent Lamp.
LAMP TESTING PHOTOMETERS. See Photometers, Lamp Testing.

LATHES
(Special for use in Motor Repairing and Motor Mfg.—Test Bench Lathes).
Ajax Electric Co., Kalamazoo, Michigan.
Allen Electric & Equipment Co., Kalamazoo, Michigan
Cincinnati Lathe & Tool Co., 3207 Disney (Oakley) Cincinnati, Ohio.
Hobart Bros. Company, Troy, Ohio. (Test Bench).
South Bend Lathe Works, 425 E. Madison, South Bend, Ind.
Weidenhoff, Joseph, 4352 W. Roosevelt Rd., Chicago, Ill.

LAVA. See Cores, Resistance Coil.

LEAD
American Lead Co., 3112 Penn Ave., Pittsburgh, Pa.
Blatchford Co., E. W., 608 Dearborn, Chicago, Ill.
Columbia Smelting & Refining Wks., 365 West, New York, N. Y.
Eagle-Picher Lead Co., 134 N. LaSalle, Chicago, Ill.
Federated Metals Corp., Woolworth Bldg., New York, N. Y.
Jacobson & Son Co., I. M., 15304 Idaho, Detroit, Mich.
National Lead Co., 111 Broadway, New York, N. Y.
Raymond Lead Co., 735 S. Washtenam Ave., Chicago, Ill.
Turner Lead Co., East St. Louis, Ill.
United Metals Selling Co., 25 Broadway, New York, N. Y.

LEAD-IN WELDS, Lamp. See Filaments, Incandescent Lamp.
LEADS, FLEXIBLE (Commutator Brush). See Brushes, Commutator.

LENSES
Sign Letter, Flashlight, Projector and Reflector Lenses Also glass caps, jewels and bezels for all electrical devices See also Jewels, Instrument Bearing.
Bausch & Lomb Optical Co., 635 St. Paul, Rochester, N. Y. (Condensing and Projection Lenses.)
B. B. T. Corp. of America, Atlantic Bldg., Philadelphia, Pa.
Corning Glass Wks, Corning, N. Y. (Flashlight and Signal.)
Deknatel & Sons, J. A., Queens Village, N. Y.
Goerz American Optical Co., C. P., 317 E. 34th, New York.
Jefferson Glass Co., Follansbee, W. Va. (Sign and Flashlight.)
Kliegl Bros. Universal Stage Ltg. Co., 321 W. 50th, New York, N. Y. (Condensing and Projector.)
Macbeth Evans Glass Co., Dept. G, Eastern Division, Charleroi, Pa (Flashlight.)
North Light Corp., 30 W. 15th, New York, N. Y.
Popper & Sons, Leo, 147 Franklin, New York, N. Y.
Pyle National Co 1334 N. Kostner Ave., Chicago, Ill.
Rochester Glass Products, Inc., 29 N. Water, Rochester, N. Y.
Rodefer Glass Co., Bellaire, O. (Flashlight.)

Sneath Glass Co., Hartford City, Ind. (Sign.)
Stromberg-Carlson Telephone Mfg. Co., 1050 University Ave., Rochester, N. Y.

LETTERS, Sign
Glass. Metal.
Adsign Corp, 113 W. 63rd, New York, N. Y.
Chain Products Co., 3924 Cooper Ave., Cleveland, O. (Brass and White Metal.)
Chicago Miniature Lamp Co., 654 W. Lake, Chicago, Ill. (Raised Letters for Signs.)
Eradium. See Pioneer Corporation.
Federal Elec. Co., 8700 S. State, Chicago, Ill. (Metal.)
Grammes & Sons, Inc., L. F., Allentown, Pa.
Heralite. See Pressed Prism Plate Glass Co.
Kolux Glass Sales Co., Kokomo, Ind.
Lu-Mi-Nus Signs, Inc., 2736 Wentworth Ave., Chicago, Ill.
Manhattan Elect. Supply Co., 510 Sixth Ave., New York, N. Y. (For Gas Signs.)
Opalite Corp., 201 E. Ohio, Chicago, Ill.
Pioneer Corporation, 8305 Yale Ave., Chicago. (Luminous.)
Pressed Prism Plate Glass Co., Chicago, Ill. (Glass.)

LIFTS, Armature
Lifts, Hoists, Jacks, Trucks, Buggies, Floor Cranes.
Columbia Machine Works & Malleable Iron Co., Atlantic Ave. & Chestnut St., Brooklyn, N. Y.
Duff Mfg. Co., Pittsburgh, Pa.
Electric Service Supplies Co., 17th & Cambria Sts., Philadelphia, Pa.
Peerless. See Electric Service Supplies Co.
Ridlon Company, Frank, Boston, Mass.

LININGS, Socket
Remington Mfg. Co., 937 Barnum Ave., Bridgeport, Conn.

LOCK WASHERS. See Washers, Lock.
LOOP WINDERS & SPREADERS. See Winding Machines, Armature & Field Coil.
LOUD SPEAKER DIAPHRAGMS MATERIAL. See Cloth, Untreated; also Parchment Paper.

LOUD SPEAKERS
Manufacturers Units and Electric Pick-ups for Portable and Built-in Types.
Amertox. See American Reproducer Co.
American Reproducers Co., 1204 Summit Ave., Jersey City, N. J.
A. R. C. See American Reproducers Co.
Amplion. See Woolf, J. W. & W. L.
Balsa Wood Co., 158 Pioneer, Brooklyn, N. Y.
Baritone Mfg. Co., 846 Jackson Blvd., Chicago, Ill.
Brooklyn Metal Stamping Corp., 720 Atlantic Ave., Brooklyn, N. Y. (Electric Pick-up.)
Cannonball. See Cannon & Miller Co.
Cannon & Miller Co., Springwater, N. Y.
Chelten Electric Co., 4859 Stenton Ave., Philadelphia, Pa.
Conamic. See Operadio Mfg. Co.
Decatur Mfg. Co., 45 Harman St., Brooklyn, N. Y.
Dreher & Son, Chas., 157 Spring, New York, N. Y.
Dymac. See Electrical Products Mfg. Co.
Electrical Products Mfg. Co., Providence, R. I.
Electrical Research Laboratories, 2500 Cottage Grove Ave., Chicago, Ill. (Units.)
Empire United Hat Block Co., 312 E. 22nd, New York.
Engineers Service Co., 25 Church, New York, N. Y. (Kit.)
Ensco. See Engineers Service Co.
Fenco Cone Co., 57 Murray, New York, N. Y. (Kit.)
Fidelity Radio Corp., Salt Lake City, Utah.
F. & H. Radio Laboratories, Fargo, N. D.
Globe Technolian Corp., Reading, Mass.
G. R. P. See Penn Mfg. Co.
Grutal Speaker Co., 609 E. Walnut, Des Moines, Iowa.
Jensen Radio Mfg. Co., 6601 S. Lavanie Ave., Chicago, Ill.
Kersten Radio Equipment, Inc., 1415 Fillford, Kalamazoo, Mich.
Kyle. See Newcombe-Hawley.
Lata Balsa. See Balsa Wood Co.
Magnavox Co., 4250 Horton, Oakland, Cal. Also Units.
Mandel Electric Co., 2157 N. California Ave., Chicago, Ill.
Markone Radio Mfg. Co., 303 Devoe, Brooklyn, N. Y. (Horn.)
Minuet. See Thompson Radio Co.
Newton Elec'l Mfg. Co., Newton, Mass.
O'Neil Mfg. Corp., West New York, N. J.
Operadio Mfg. Co., St. Charles, Ill.
Oxford Radio Corp., 3200 Carroll Ave., Chicago, Ill.
Peerless. See United Reproducers Corp.
Philadelphia Storage Battery Co., Ontario & C Sts., Philadelphia, Pa.
Philco. See Philadelphia Storage Battery Co.
Platter Cabinet Co., North Vernon, Ind.
Powerola. See Temple Corp.
Puronower. See Platter Cabinet Co.
Quam Radio Products Co., Div. of United Air Cleaner Corp., 9705 Cottage Grove Ave., Chicago, Ill.
Racon Elec. Co., 18 Washington Place, New York, N. Y. (Horn only.)
Red Lion Cabinet Co., Red Lion, Pa.
Stromberg-Carlson Tel. Mfg. Co., 1060 University Ave., Rochester, N. Y.
Swoboda Co., Maritime Bldg., Seattle, Wash.
Temple Corp., 5253 W. 65th, Chicago, Ill.
Thompson Radio Co., 25 Church, New York, N. Y.
Ultratone Mfg. Co., 1046 W. Van Buren, Chicago, Ill.
United Reproducers Corp., 25 Leighton Ave., Rochester, N. Y.
Universal. High Power Telephone Co., Carleton Ave. and Eddy, Seattle, Wash.
Utah Radio Products Co., 1615 S. Michigan Ave., Chicago, Ill. (Also Piano Unit.)
Victor Radio Corp., 4321 N. Western Ave., Chicago, Ill.
Wonderphone. See Universal High-Power Telephone Co.
Woolf, J. W. & W. L., 133 W. 21st, New York, N. Y.
Wright-De Coster, Inc., St. Paul, Minn.

LUGS, Copper
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Dante Elect. Mfg. Co., Bantam, Conn.

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The first of a series of articles on bearings, on page 48 of this issue

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Pendants (Bulbs) .....See P
Standard Parts .....See S

Acornlite Studios, 675 72nd, Brooklyn, N. Y..... P
Arrow Electric Div. of Arrow-Hart & Hegeman Elec. Co., Hartford, Conn..... S P
Bryant Electric Co., Bridgeport, Conn..... P
Connecticut Elec. Mfg. Co., Bridgeport, Conn..... S
Cutler-Hammer, Inc., 1288 St. Paul Ave., Milwaukee, Wis.
Eagelite. See Eagle Elec. Mfg. Co.
Eagle Elec. Mfg. Co., 79 Hall, Brooklyn, N. Y..... P
General Elec. Co., Merchandise Dept., Bridgeport, Conn..... S P
Glow Lite. See Rodale Mfg. Co.
Glow Tip. See Arrow Electric Co.
Hart & Hegeman, Div. of Arrow-Hart & Hegeman Electric Co., Hartford, Conn..... S P
Hubbell, Inc., Harvey, Bridgeport, Conn..... P
Luma & Luma Lite. See Radium Dial Co.
Radieye. See General Electric Co.
Radium Dial Co., 3532 Forbes, Pittsburgh, Pa.... C P
Reynolds Spring Co., Jackson, Mich..... S
Rodale Mfg. Co., 200 Hudson, New York, N. Y..... P
Seelite. See T. C. Smith & Co.
Smith & Co., T. C., 3915 Powelton Ave., Philadelphia .. P
Spot O Lite. See Hart & Hegeman Mfg. Co.
Undark. See United States Radium Corp.
United States Radium Corp., 535 Pearl, New York, N. Y. ..... C S P

MACHINE SCREWS. See Screws, Machine.

MACHINE SCREW PRODUCTS. See Screw Machine Products.

MACHINES

Armature Banding. See Banding Machines, Armature
Armature Notching. See Notching Machines, Armature
Balancing. See Balancers, Armature.
Banding. See Banding Machines, Armature.
Cable Armoring. See Wire Manufacturing Machines
Coil Shaping. See Shaping Machines, Coil.
Coil Taping. See Taping Machines, Coil.
Coil Winding. See Winding Machines.
Commutator Slotting. See Mica Undercutters.
Engraving. See Engraving Machines.
Incandescent Lamp Making. See Machines, Lamp Making
Molded Insulation. See Presses, Molded Insulation.
Perforating. See Perforating Machines.
Porcelain Molding. See Presses, Porcelain Molding
Radio Tube. See Machines, Lamp Making.
Shaping. See Shaping Machines, Coil.
Slotting. See Mica Undercutters.
Soldering. See Soldering Machines, Commutater.
Spring Making. See Spring Making Machines.
Taping. See Taping Machines, Coil.
Tension. See Tension Machines, Band Wire.
Winding. See Winding Machines.
Wire, Armoring. See Wire Manufacturing Machines.
Wire Drawing. See Wire Drawing Machinery.
Wire Insulator. See Wire Manufacturing Machines.
Wire Measuring. See Wire Manufacturing Machines
Wire Tension. See Tension Machines, Band Wire
Wire Wrapping. See Wire Wrapping Machines.

MACHINES, Lamp Making

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Czerwenka, Frank, 35 Monroe, Passaic, N. J. (Bombarding Machines.)
Dwyer Machine Co., Lynn, Mass.
Eisler Electric Corp., 770 S. 13th, Newark, N. J.
General Engineering & Supply Co., 160 5th Ave., New York N. Y. (Filament Winder.)
Gesco. See General Engineering & Supply Co.
Radio Elect. Wks., 150 W. 22nd, New York, N. Y.
Sleeper & Hartley, Inc., Worcester, Mass.
York Elec. & Machine Co., 30 Penn, York, Pa.

MACHINES, Bombarding. See Machines, Lamp Making.
MACHINES, Pleating and Fluting. See Pleating Machines.
MACHINES, Spring Making. See Spring Making Machines
MACHINES, WIRE MANUFACTURING. See Wire Manufacturing Machines.
MAGNET CHARGERS. See Chargers, Magnet.
MAGNET STEEL. See Steel, Magnet.
MAGNET TESTERS. See Instruments, Portable and Switchboard; also Instruments, Pocket.
MAGNET WIRE MACHINES. See Enameling Machines for Magnet Wire.
MAGNETIC CHUCKS. See Chucks, Magnetic.
MAGNETIC CLUTCHES. See Clutches, Magnetic.
MAGNETOMETERS. See Instruments, Pocket.

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Valley Appliances, Inc., 634 Lexington Ave., Rochester, N. Y.

MALLETS, Raw Hide

Chicago Rawhide Mfg. Co., 1313 Elston Ave., Chicago, Ill.
Crude Pelt. See Chicago Rawhide Mfg. Co.
Holbrook Raw Hide Mfg. Co., 748 N. Main, Providence, R. I.

MANGANESE, Battery. See Chemicals, Battery.

MARKERS AND STAMPERS, Metal

Schmidt, Inc., Geo. T., 4102 Ravenswood Ave., Chicago, Ill.

MEASURING INSTRUMENTS. See Instruments.
METAL CUTTING OUTFITS. See Welding and Cutting
MECHANICAL RUBBER GOODS. See Rubber Mechanical Goods.
MEGOHMMETERS. See Instruments, Laboratory Standard
MERCURY SWITCHES. See Switches, Mercury.
METAL CLEANERS (Compound). See Cleaners, Metal.
Outfits.
METAL FINISHING. See Plating & Finishing.
METAL MARKING OUTFITS. See Engraving Machines
METALLIC SHADES. See Shades, Metallic.
METERS. See Instruments.
MICA SHADES. See Shades, Mica.
MICA TAPE. See Tape, Mica.
MICA UNDERCUTTERS. See Slotting Machines & Tools Commutator.

MICA

Asheville Mica Co., Biltmore, N. C.
Asco. See Schoonmaker Insulation Co.
Brand & Co., William, 293 Fourth Ave., New York, N. Y.
Chicago Mica Co., 345 Campbell, Valparaiso, Ind.
Colonial Mica Co., 136 Seventh, Jersey City, N. J.
Fillion, S. O., 68 Murray, New York, N. Y.
Ford Radio & Mica Corp., 113 Bleecker, New York, N. Y.
Gerdau Co., Otto, 533 Canal, New York, N. Y.
Hirsch Mica Co. 1087 Flushing Ave., Brooklyn, N. Y.
Hoyt, Inc., Philip S., Los Tablos, New Mexico
Huse-Liberty Mica Co., 73 Long Wharf, Boston, Mass.
International Mica Co., 3660 Brandywine, Philadelphia, Pa
Kant Krack. See Huse Liberty Mica Co.
Keene Mica Co., Keene, N. H.
Macallen Co., Boston 27, Mass.
Micabond. See Chicago Mica Co.
Mitchell-Rand Mfg. Co., 19 Vesey, New York, N. Y.
Miralite. See Mitchell-Rand Mfg. Co.
Mica Insulator Co., 200 Varick, New York, N. Y.
Mica Mfg. Co., 135 Johnson, Brooklyn, N. Y.
Micanite. See Mica Insulator Co.
Mica Products Mfg. Co., 54 Greene, New York, N. Y.
Munsell & Co., Eugene, 200 Varick, New York, N. Y.
Nemco. See New England Mica Co.
New England Mica Co., Waltham, Mass.
New England Minerals, Inc., 85 Devonshire, Boston, Mass
New York Mica & Mfg. Co., Auburn, N. Y.
Peerless. See New England Mica Co.
Prestonite. See Robt. K. Preston Mica Co.
Preston Mica Co., Robt. K., 957 Monadnock Blk., Chicago. (Ground Mica.)
Red Streak. See Huse Liberty Mica Co.
Rogers-Pyatt Shellac Co., 81 Water St., New York. (Imp.)
Schoonmaker Insulation Co., A. O., 34 University Place, New York, N. Y.
Storrs Mica Co., 11 Park Place, New York, N. Y.
Tar Heel Mica Co. Plumtree, N. C.
Watson Bros., 170 Purchase, Boston, Mass.

MINIATURE SWITCHBOARD SYSTEMS. See Instruments, Portable and Switchboard.
MIXERS, INSULATION. See Insulation Mixers.

MOLDED

Presses. See Presses, Molded Insulation.
Radio Parts. See Radio Molded Parts.
Shades. See Molded Insulation.

MOLDED INSULATION

Aico. See American Insulator Corp.
Allen & Hills, Inc., Auburn, N. Y.
Ambler Asbestos Shingle & Sheathing Co., Ambler, Pa. (Cold.)
Ambleroid. See Ambler Asbestos Shingle & Sheathing Co.
American Insulator Corp., New Freedom, Pa.
American Machine & Foundry Co., 5520 Second Ave., Brooklyn, N. Y.
Amerine. See American Insulator Corp.
Anderson Mfg. Co., Albert & J. M., 289 A, Boston, Mass.
Auburn Button Wks., 48 Canoga, Auburn, N. Y.
Bakelite Corp., 247 Park Ave., New York, N. Y.
Bay State Moulding Co., 1197 Dorchester Ave., Boston
Belden Mfg. Co., 2310B S. Western Ave., Chicago, Ill
Beldenmold. See Belden Mfg. Co.

Bell Mfg. Co., 11 Elkins, Boston, Mass. Radio Parts.
Bettle. See Synthetic Plastics Co., Inc.
Boonton Molding Co., Boonton, N. J.
Boonton Rubber Mfg. Co., 223 Fanny Rd., Boonton, N. J.
Bre-lite Moulding Corp., 109 Hudson, Jersey City, N. J. (Wood Composition.)
Celluloid Corp., 10 E. 40th, New York, N. Y.
Coltrock. See Colt's Patent Firearms Mfg. Co.
Charmond Elec. Corp., 30 Church, New York, N. Y.
Chicago Molded Products Co., 2149 Walnut, Chicago, Ill.
Cincinnati Molding Co., 2037 Florence Ave., Cincinnati, O.
Colasta Co., Hoosick Falls, N. Y.
Colt's Patent Fire Arms Mfg. Co., Hartford, Conn.
Compo-Site, Inc., 207 Astor, Newark, N. J.
Condensite. See Bakelite Corp.
Connecticut Elec. Mfg. Co., Bridgeport, Conn.
Continental-Diamond Fibre Co., Bridgeport, Pa.
Cutler-Hammer, Inc., 1288 St. Paul Ave., Milwaukee.
Dayton Insulating Molding Co., 434 E. First, Dayton, Ohio.
Diemoulding Production Co., Canastota, N. Y.
Dimec. See Dayton Insulating Moulding Co.
Durez. See General Plastics, Inc.
Electrose. See Insulation Mfg. Co.
Erinoid Co., Park Row Bldg., New York, N. Y.
Evercool. See Bakelite Corp.
Formica Insulation Co., 4626 Spring Grove Ave., Cincinnati.
Garfield Mfg. Co., Garfield, N. J. Composition. (Cold.)
General Electric Co., Schenectady, N. Y.
General Moulded Composition Co., 213 Market, Lynn, Mass.
General Plastics, Inc., 109 Walck Rd., N. Tonawanda, N. Y.
Gummor. See Garfield Mfg. Co.
Hahn Mfg. Co., Harry W., 623 S. San Pedro, Los Angeles, Cal.
Herculite. See Colosta Co.
Hi-Heet. See Insulation Mfg. Co.
Imperial Molded Products Co., 2925 W. Harrison, Chicago.
Improco. See Insulation Products Co.
Inda. See American Machine & Foundry Co.
Insulation Mfg. Co., New York Ave. and Herkimer St., Brooklyn, N. Y.
Insulation Products Co., Richland, Pittsburgh, Pa.
Insuline Corp. of America, 78 Cortlandt, New York, N. Y.
International Insulating Corp., Elyria, O.
Karolith Corp., 189 13th, Long Island City, N. Y. (Casein plastics.)
Kellite. See Kellogg Switchboard & Supply Co.
Kellogg Switchboard & Supply Co., 1066 W. Adams, Chicago, Ill.
Klagges, Chas., 128 147th, Ozone Park, N. Y.
Kurz-Kasch Co., Dayton, O.
Lacanite. See Scranton Button Co.
Luco Products Corp., 40 Flatbush Ave. Extension, Brooklyn, N. Y.
Lumarith. See Celluloid Corp.
Luxite. See Wilbur & Williams Co.
Macallen Co., Boston, 27, Mass.
Mack Molding Co., Wayne, N. J.
Makalot. See Johnson Molding & Tool Co.
Megohom. See Waterbury Button Co.
Micarta Fabricators, Inc., 309 Canal, New York, N. Y.
Micarta. See Westinghouse Elec. & Mfg. Co.
Mico. See Molded Insulation Co.
Modern Molded Products Co., Blount and Elm Sts., Providence, R. I.
Molded Insulation Co., Mt. Vernon, N. Y.
New England Products Co., 232 Greenwich, New York, N. Y.
Niagara Insul-Bake Specialty Co., 483 Delaware Ave., Albany, N. Y.
Nixon Nitration Works, Nixon, N. J.
Nixonoid. See Nixon Nitration Works.
Noark. See Colt's Patent Fire Arms Mfg. Co.
Norloc. See Norton Laboratories, Inc.
Northern Industrial Chemical Co., 11 Elkin, South Boston.
Norton Laboratories, Inc., 1025 Mill, Lockport, N. Y.
Panelyte Corp., Trenton, N. J.
Paramix. See Sniitdorf Radio Corp.
Paratherm. See Scranton Button Co.
Phenolic. See Scranton Button Co.
Plastic Molding Corp., Sandy Hook, Conn. (Cold.)
Pollopas. See Wilbur & Williams.
Pruven Composition Products Corp., Milford, Conn.
Pruvenite. See Pruven Composition Products Co.
Pyrolax. See Cutler-Hammer Mfg. Co.
Recto Mfg. Co., 23 W. 3rd, Cincinnati, O.
Redmonol. See Bakelite Corp.
Rexlite. See Northern Industrial Chemical Co.
Reynolds Spring Co., Jackson, Mich.
Reynoldite. See Reynolds Spring Co.
Reynomold. See Reynolds Spring Co.
Richardson Co., Lockland, Cincinnati, O.
Ridgelite. See Ridgley Trimmer Co.
Ridgley Trimmer Co., Springfield, O.
Schneider Bros., Inc., 312 N. Sheldon Ave., Chicago.
Scranton Button Co., Scranton, Pa.
Shaw Insulator Co., Irvington, Newark, N. J.
Siemon Co., State and Dewey, Bridgeport, Conn.
Specialty Insulation Mfg. Co., Hoosick Falls, N. Y.
Star Insulate. See Insulation Mfg. Co.
Starite. See Insulation Mfg. Co.
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Textolite. See General Elec. Co.

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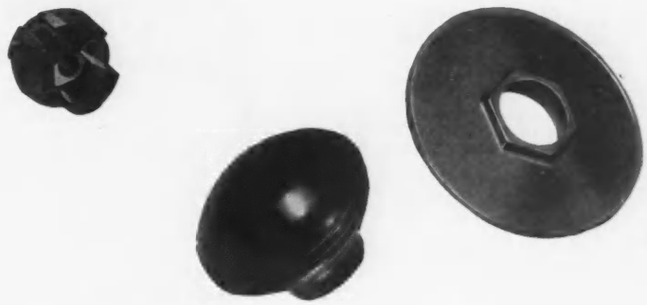

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American Electro Metal Corp., 65 Madison Ave., New York, N. Y.
Elkon, Inc. (Div. of P. R. Mallory Co.), 350 Madison Ave., New York, N. Y.
Lobfeld & Co., J. L., 53 Park Place., New York, N. Y.
Palatine Industrial Co., 111 Fifth Ave., New York, N. Y.
Radiotherma, Inc., 45 E. 17th, New York, N. Y.
Sirian Wire Co., 255 Sherman Ave., Newark, N. J.

MONEL METAL
International Nickel Co., 67 Wall, New York, N. Y.
MOTOR CONTROLLERS. See Controllers, Motor.
MOTOR PLATFORM BASES. See Bases, Motor Platform
MOTOR STARTERS. See Controllers, Motor; Switches, Remote Control; Switches, Motor Starting; Safety; Switches Snap (Heavy Duty).

MOTORS

Alternating Current	See	S			
Direct Current	See	S			
Motors, 1 Hp. up	See	M			
Motors Fractional Hp.	See	F			
Universal	See	U			
Actodector. See Roth Bros. Co., Div. of Century Electric Co.					
Advance Elec. Co., 4311 Maple Ave., St. Louis	M	F	S	..	
Allis-Chalmers Mfg. Co., Milwaukee, Wis.	M	..	S	..	
Allis Co., Louis, Milwaukee, Wis.	M	..	S	..	
American Elec. Motor Co., Cedarburg, Wis.	M	..	..	..	
Apex Elec'l Mfg. Co., 1067 E. 152nd, Cleveland	..	F	S	U	
Armor Elec. Mfg. Co., 1020 Holland, Erie, Pa.	M	..	..	..	
Baldor Elec. Co., 4353 Duncan Ave., St. Louis	M	F	S	..	
B-Line. See Brown-Breckmeyer Co.					
Bodine Elec. Co., 2254 Ohio, Chicago	..	F	S	U	
Bogue Elec. Co., Chas. J., 132 King, New York	M	..	..	..	
Brown-Breckmeyer Co., Norwood Power Bldg., Dayton, O.	M	F	..	..	
Burke Elec. Co., Erie, Pa.	M	F	S	U	
B. T. See Allis Co., Louis.					
B & R Mfg. Co., 812 Lafayette, Toledo, O.	..	F	..	..	
Century Elec. Co., 1806 Pine, St. Louis, Mo.	M	F	S	..	
Chandeysson Elec. Co., St. Louis, Mo.	M	..	S	..	
Clark, Jr., Elec. Co., James, 600 E. Bergman, Louisville, Ky.	M	..	..	..	
Cleveland Armature Wks., 4735 St. Clair Ave., Cleveland, O.	M	..	S	..	
Comet Elec. Co., 47 Union Trust Bldg., Indianapolis, Ind.					
Continental Elec. Co., 14 Magazine, Newark	M	..	S	..	
Crocker-Wheeler Elec. Mfg. Co., Ampere, N. J.	M	..	S	..	
Cushman Elec. Co., Concord N. H.	M	F	S	..	
Day-Fan Electric Co., Dept. A, Dayton, O.	..	F	S	..	
Diehl Mfg. Co., Elizabeth, N. J.	M	F	S	..	
Diverter Pole. See Rochester Elec. Product Co.					
Domestic Electric Co., 7209 St. Clair Ave., Cleveland, O.	..	..	..	..	
Dumore Co., 35 16th, Racine, Wis.	..	F	..	U	
Eclipse. See Fidelity Elec. Co.					
Electric Machinery Co., Minneapolis, Minn.	M	..	S	..	
Electric Products Co., 1725 Clarkstone Rd., Cleveland, O.	..	..	..	..	
Electric Specialty Co., 221 South Stamford, Conn.	M	F	S	U	
Electro-Dynamic Co., Bayonne, N. J.	M	..	S	..	
Emerson Electric Mfg. Co., 2018 Washington Ave., St. Louis, Mo.	M	F	S	U	
Engberg's Elec. & Mechl. Works, St. Joseph, Mich.	M	..	S	..	
Exec. See Electric Specialty Co.					
Fairbanks-Morse & Co., 900 S. Wabash Ave., Chicago, Ill.	M	F	..	..	
Fidelity Elec. Co., Lancaster, Pa.	M	F	S	U	
Fitzgerald Mfg. Co., Torrington, Conn.	..	F	..	..	
Fynn Weichsel. See Wagner Elec. Corp.					
Galvin Elec. Mfg. Co., 3314 S. Broadway, St. Louis, Mo.	..	F	..	A	
General Elec. Co., Schenectady, N. Y.	M	F	S	U	
Gilbert Co., A. C., New Haven, Conn.	..	F	..	U	
Hamilton Beach Mfg. Co., Racine, Wis.	..	F	S	U	
Hobart Bros. Co., Troy, O.	M	..	S	..	
Holtzer-Cabot Elec. Co., 125 Amory, Boston	M	F	S	..	
Howell Elec. Motors Co., Howell, Mich.	M	..	S	..	
Ideal Elec. & Mfg. Co., Mansfield, O.	M	..	S	..	
Imperial Electric Co., Akron, O.	M	..	S	..	
Janette Mfg. Co., 551 W. Monroe, Chicago	..	F	S	..	
Jantz & Leist Elec. Co., Cincinnati, O.	..	M	F	..	
Jeannin Electric Co., Fassett & N. Y. C. R. R. Toledo, O.	M	F	S	..	
Kendrick & Davis Co., Lebanon, N. H.	..	F	S	..	
Kimble Elec. Co., 634 N. Western Ave., Chicago	M	..	..	U	
Knapp Elec., Inc., Portchester, N. Y.	..	F	S	U	
Leland Elec. Co., Dayton, O.	..	F	S	..	

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L. E. See Leland Elec. Co.
Lincoln Elec. Co., Cleveland, Ohio | M | .. | S | ..
Line-Weld. See Lincoln Elec. Co.
Linzee Elec. Motor Co., Mansfield, O. | M | .. | .. | ..
Mando Co., 911 Stais Tower Bldg., Syracuse, N. Y. (6-12-40 Volt only) | .. | F | .. | ..
Marathon Elec. Mfg. Co., 32 Island, Wausau, Wis. | .. | F | .. | ..
Marble-Card Elec. Co., Gladstone, Mich. | M | .. | .. | ..
Master Electric Co., Dayton, O. | M | F | S | ..
MC. See General Electric Co.
Michigan Elec. & Mfg. Co., Lake Linden, Mich. | .. | F | S | ..
N. C. See Electric Controller & Mfg. Co.
Norfolk. See Walter Elec. Mfg. Co.
North East Elec. Co., Rochester, N. Y. | .. | F | .. | U
Northwestern Mfg. Co., 480 Clinton, Milwaukee | M | .. | .. | ..
Ohio Elec. & Controller Co., 5903 Maurice Ave., Cleveland, Ohio | .. | F | S | ..
O. K. See Marathon Elec. Mfg. Co.
Osann Co., F., 245 Seventh Ave., New York | M | .. | .. | ..
Peerless Elec. Co., 740 W. Market St., Warren, O. | M | F | S | U
Polar Cub. See Gilbert Co., A. C.
Pow-R-Full. See Wagner Elec. Corp.
Reco. See Reynolds Electric Co.
Red Band. See Howell Elec. Motors Co.
Reliance Elec. & Engrg. Co., 1042 Ivanhoe Rd., Cleveland, O. | M | .. | S | ..
Reynolds Electric Co., 2650 W. Congress, Chicago | .. | F | S | ..
Robbins & Myers, Inc., Springfield, O. | M | F | S | U
Roth Bros. & Co., Div. of Century Elec. Co., 1400 W. Adams, Chicago, Ill. | M | F | S | ..
Standard. See Robbins & Myers Co.
Star Elec. Motor Co., Miller St. & N. J. R. R. Ave., Newark, N. J. | M | .. | S | ..
Sterling Elec. Motors, Inc., Telegraph Rd. and Atlantic Blvd., Los Angeles, Cal. | M | .. | S | ..
Stow Mfg. Co., Binghamton, N. Y. | M | F | S | U
Sturtevant Co., 15 Devonshire (Hyde Park), Boston, Mass. | M | F | S | U
Sunlight Electrical Mfg. Co., Warren, O. | .. | F | S | ..
Super Wick. See Master Elec. Co.
Switch start. See Lincoln Elec. Co.
Union Elec. Motor Mfg. Co., Hancock & Oxford Sts., Philadelphia, Pa. | M | F | S | ..
U. S. Elec. Mfg. Co., 200 E. Slawson Ave., Los Angeles | M | .. | S | ..
Valley Elec. Co., 4221 Forest Park Blvd., St. Louis, Mo. | M | .. | S | ..
Wagner Elec. Corp., 6400 Plymouth Ave., St. Louis, Mo. | M | F | S | U
Walter Elec. Mfg. Co., Norfolk, Va. | M | .. | S | ..
Watson. See Allis Co., Louis.
Welco Uniframe. See Wesche Elec. Co., B. A.
Wesche Elec. Co., B. A., 1622 Vine, Cincinnati | M | F | S | ..
Westinghouse Elec. Mfg. Co., East Pittsburgh | M | F | S | ..
Wiley-Wray Elec. Co., 1522 Central Parkway, Cincinnati, O. | M | .. | S | ..
Wood Mach. Co., S. A., Boston | M | F | S | ..
Zobell Elec. Motor Co., Garwood, N. J. | M | .. | S | ..

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See also Decalcomania.
American Name Plate Co., 117 Imlay, Brooklyn, N. Y
Angell Embossing Co., 37 Barney-Smith Co., Dayton, O.
Chandler Co., Springfield, Mass.
Continental-Diamond Fibre Co., Bridgeport, Pa.
Crowe Name Plate & Mfg. Co., 1749 Grace, Chicago, Ill.
Electro-Chemical Engraving Co., 52 Vanderbilt Ave., New York, N. Y.
Etched Products Corp., 90 Tenth, Long Island City, N. Y.
Etching Co. of America, 1520 Montana, Chicago, Ill.
General Etching & Mfg. Co., 3070 W. Grand Ave., Chicago, Ill.
Grammes & Sons Inc., L. F., Allentown, Pa.
Premier Metal Etching Co., 14th & Van Alst Ave., Long Island City, N. J.
Turner Brass Works, Sycamore, Ill.
Waterbury Button & Moulding Co., Waterbury, Conn.

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Driver-Harris Co., Harrison, N. J.
International Nickel Co., 67 Wall, New York, N. Y
National-Harris Wire Co., 195 Verona Ave., Newark, N. J
Seymour Mfg. Co., Seymour, Conn.

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Ferracute Machine Co., Bridgeton, N. J.
Niagara Machine & Tool Wks., 637 Northland Ave., Buffalo, N. Y.

NUT SETTING MACHINES
Vim Electric Tool Co., 149 Broadway, New York, N. Y
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OIL-LESS BEARINGS. See Bearings, Oil-less.
OSCILLOSCOPES. See Instruments, Laboratory Standard

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Despatch Oven Co., 622 Ninth, S. E., Minneapolis, Minn.
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Devine Mfg. Co., J. P., Mount Vernon, Ill.
Eberbach & Son Co., Ann Arbor, Mich. (Drying.)
Electric Heat Control Apparatus Co., 245 New Jersey R. R Ave., Newark, N. J.
Emerson Apparatus Co., Melrose, Mass. (Conditioning.)
Freas Thermo Elec. Co., 1206 Grove, Irvington, N. J.
Gehnrich Indirect Heat Oven Co., Long Island City, N. Y
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Lydon Bros., 229 Colden, Jersey City, N. J.
Maehler Co., Paul, 2210 Lake, Chicago, Ill.
Mino Co., 717 Sycamore, Cincinnati, O.
Radio Elec'l Wks., 150 W. 22nd, New York, N. Y.
Sargent & Co., E. H., 155 E. Superior, Chicago, Ill.
Sioux Battery & Mfg. Co., Sioux City, Ia. (Battery.)
Snead & Co., Jersey City, N. J.
Standard Elec. Stove Co., Toledo, Ohio.
Steiner & Co., K. E., 197 E. Kinney St., Newark, N. J.
Stokes Machine Co., F. J., 5834 Tabor Rd. (Olney), Philadelphia.
Swartwout Co., 18522 Euclid Ave., Cleveland, O.
Thelco. See Freas Thermo Elec. Co.
Westinghouse Elec. & Mfg. Co., Mansfield, O.
Young Bros. Co., 6523 Mack Ave., Detroit, Mich.
OXIDES, Battery. See Chemicals, Battery.

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Federal Metallic Packing Co., Wakefield, Mass.
Holed-Tite Packing, Inc., 100 E. 42nd, New York, N. Y.
Packtite. See Federal Metallic Packing Co.

PAINT, Varnish, Lacquer

KEY
Varnishes, Insulating ..... See V
Painting, Dipping, Spraying, Vacuum Impregnating.
Paint, Insulating and Acid Proof.. See P
Lacquer, Metal Finishing ..... See L

Acme White Lead & Color Wks., 3250 St. Aubin Ave., Detroit, Mich.			L
Ajax. See Sherwin-Williams Co.			
Alaka. See Lacquer & Chemical Corp.			
American Di-Electrics, Ltd., Hancock and Bodine, Long Island City, N. Y.	V	..	..
American Lastite Co., 3168 Lincoln Ave., Chicago	..	P	L
American Wurtzilite Co., Builders Bldg., Chicago	..	P	..
Antakwa Co., 1329 Mohawk, Chicago, Ill.	..	P	..
Arizona Lacquer Mfg. Co., 7 16th, Brooklyn, N. Y.	..	..	L
Armlac. See Robertson Chemical Co.			
Arolac. See Arizona Lacquer Mfg. Co.			
Art-Craft. See Southwestern Paint & Varnish Co.			
Atlantic Chemical Co., Colt, Irvington, N. J.	..	..	L
Atom Chemical Co., 96 E. 10th, New York, N. Y.	..	..	L
Bakelite Corp., 247 Park Ave., New York, N. Y.	..	..	L
Benolite Varnish Co., 501 Columbia Bank Bldg., Pittsburgh	V	P	..
Berry Bros., Leib & Wight, Detroit, Mich.	V	..	..
Billings-Chapin Co., 1163 E. 40th, Cleveland, O.	V	..	..
Biwax Corp., 208 S. La Salle, Chicago, Ill.	..	P	..
Bradley-Hurtz Co., 2620 S. Dearborn, Chicago, Ill.	..	..	L
Brevolite. See Waukegan Chemical Co.			
Calman & Co., Emil, 42 Vernon Blvd., Long Island City, N. Y.	V	P	..
Carbofold Products Corp., 15 Park Row, New York.	V	P	..
Chadeloid Chemical Co., 75 E 45th, New York.	V	..	..
Chinalac. See Dolph Co., John C.			
Cochrane Chemical Co., 432 Danforth Ave., Jersey City, N. J.	V	P	..
Code 25. See Mitchell-Rand Mfg. Co.			
Columbus Varnish Co., 264 Cozzeins, Columbus, O.	V	..	..
Comulac. See Martindale Elec. Co.			
Continental-Diamond Fibre Co., Bridgeport, Pa.	V	..	..
Day & Co., James B., 1872 Clybourn Ave. Chicago, Ill.	..	P	L
Doe & Co., Walter S., Kent, Ohio.	V	P	..
Dolph Co., John C., 168 Emmet, Newark, N. J.	V	P	..
Duco. See Du Pont de Nemours & Co.			
Du Pont de Nemours & Co., Wilmington, Del.	..	P	..
Durez. See General Plastics.			
Eastman Kodak Co., Rochester, N. Y.	..	..	L
Eclipse Paint & Mfg. Co., Cleveland, O.	..	P	..
E. B. See Mitchell-Rand Mfg. Co.			
Egyptian Lacquer Mfg. Co., 90 West, New York.	..	..	L
Electric Lacquer. See Dolph Co., John C.			
Enamelac. See Robertson Chemical Co.			
Ever-Brite Products Co., East Liverpool, O.	..	..	L
Ferbert-Schorndorfer Co., 12815 Elmwood Ave., Cleveland, O.	V	P	L
Fesco. See Ferbert-Schorndorfer Co.			
Five Point. See American Wurtzilite Co.			
Franche & Co., 440 Orleans, Chicago, Ill.	..	..	L
General Elec. Co., Merchandise Dept., Bridgeport, Conn.	V	P	..
General Electric Co., Schenectady, N. Y.	..	..	P
General Plastics, Inc., 109 Walck Rd., N. Tonawanda, N. Y.	V	..	..
George Co., P. D., 4153 Bingham Ave., St. Louis, Mo	V	..	..
G. E. See General Elec. Co.			
Glidden Co., Cleveland, O.	V	P	L
Glyptal. See General Electric Co., Schenectady.			
H. B. See Maas & Waldstein Co.			
Hilo Varnish Corp., Marcy & Flushing Aves., Brooklyn, N. Y.	V	P	L
Impervious Varnish Corp., 421 Wood, Pittsburgh.	V	P	..
Insulaterite. See Ohmlac Paint & Refining Co.			
Insulvar. See Varflex Corp.			
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Krakles. See Waukegan Chemical Co.
Lackerite. See Twin City Shellac Co., Inc.
Lacquer & Chemical Corp., 214-40th St., Brooklyn, N. Y. .. P L
Laqueroid. See Glidden Co.
Liberty. See Antaklwa Co.
Linolac. See Mica Insulator Co.
Lowe Bros. Co., 450 E. 3rd, Dayton, O. V P ..
Lucas & Co., John, 322 Race, Philadelphia, Pa. V P ..
Lucote. See Lucas & Co., John.
Maas & Waldstein, 438 Riverside Ave., Newark, N. J. .. L
McDougall-Butler Co., Inc., Evans Water & Norton, Buffalo, N. Y. V P ..
Martindale Elec. Co., 1262 W. Fourth, Cleveland, O. V ..
Mawalac. See Maas & Waldstein.
Mecco. See Henry V. Walker Co.
Mica Insulator Co., 200 Varick St., New York V ..
M. I. C. See Mica Insulator Co.
Mitchell-Rand Mfg. Co., 19 Vesey, New York, N. Y. V P ..
Nepto Lac. See Lowe Bros. Co.
Nikolas & Co., G. J., 1227 W. Van Buren, Chicago. .. L
O'Brien Varnish Co., South Bend, Ind. V P L
Ohmlac Refining Co., 140 S. Dearborn, Chicago, Ill. .. P ..
Opex. See Sherwin-Williams Co.
Ozite. See Standard Underground Cable Co
P. & B. See Ruberoid Co.
Pecora Paint Co., 4th & Sedgeley Ave., Philadelphia, Pa. .. L
Pedigree. See George Co., P. D.
Peninsular Paint & Varnish Co., Detroit, Mich. .. L
Peerless. See Maas & Waldstein Co.
Proxlin. See Acme White Lead & Color Wks.
Pruett-Schaeffer Chemical Co., Taber, Pittsburgh. .. P L
Reliable Leather Dressing Co., 43 Crescent, Long Island City, N. Y. V ..
Republic Varnish Co., 200 Thomas, Newark, N. J. V ..
Robertson Chemical Co., 9805 Mesch Ave., Cleveland, O. V P ..
S. P. C. See Ruberoid Co.
Schenectady Varnish Co., Schenectady, N. Y. V P ..
Schorndorfer, Ferbert, 12815 Elmwood Ave., Cleveland, O. V P ..
Sherwin-Williams Co., Cleveland, O. V P L
Sipe & Co., James B., Chamber of Commerce Bldg., Pittsburgh, Pa. .. L
Southwestern Paint & Varnish Co., 610 Broadway, Kansas City, Mo V P ..
Standard Flexible Comp. Co., 1213 Franklin Trust Bldg., Philadelphia, Pa. V P ..
Standard Insulation Co., Rutherford, N. J. V ..
Standard Lacquer Co., 621 Broadway, New York, N. Y. .. L
Standard Underground Cable Co., Div. of General Cable Corp., Pittsburgh, Pa. P ..
Standard Varnish Wks., 443 4th Ave., New York V P L
Sterling Varnish Co., Haysville, Pa. V ..
Toch Bros., 443 4th Ave., New York V P L
Truscon Laboratories, Canfit & Grand Trunk Railway, Detroit, Mich. V ..
2098. See Mitchell-Rand Mfg. Co.
Twin City Shellac Co., Inc., 338 Flushing Ave., Brooklyn, N. Y. V P L
Varflex Corp., Rome, N. Y. V ..
Voltaz Co., 99 Reservoir Ave., Bridgeport, Conn. V P ..
Vulcan-Lastite. See American Lastite Co.
Waipole. See Robertson Chemical Co.
Waukegan Chemical Co., North Chicago, Ill. .. L
Walker Co., Henry V., 17 John St., New York. .. L
Westinghouse Elec. & Mfg. Co., E. Pittsburgh, Pa. V P ..
Zapon Co., Stamford, Conn. .. L
Zellac. See Zeller Lacquer Mfg. Co.
Zeller Lacquer Mfg. Co., 20 E. 49th, New York. .. L

PANELS (panel) Engraving. See Engraving.
Radio (Metal). See Radio Mountings.
Radio (Molded). See Radio Molded Parts.
Radio (Hard Rubber) See Rubber Hard.
Meters. See Instruments, Portable & Switchboard

PAPER
Boxes. See Boxes & Wrappers.
Bushings. See Tubes, Paper.
Candles. See Candles, Fixture.
Ceres. See Tubes, Paper.
Fibre. See Cloth and Paper.
Fish. See Cloth & Paper.
Insulating. See Cloth and Paper.
Parchment. See Parchment Paper.
Shades. See Shades, Fabric.
Sleeves. See Tubes, Paper.

PARAFFINE. See Wax and Compounds.

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Brown Paper Co., L. L., Adams, Mass.
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De Jonge & Co., Louis, 69 Duane, New York, N. Y.
New York & Penn Co., 200 5th Ave., New York, N. Y.
Paterson Parchment Paper Co., Passaic, N. J.
Raquette River Paper Co., Potsdam, N. Y.
Reeve & Co., Angel H., 7 Spruce, New York, N. Y.
Special Paper Mfg. Co., 96 Reade, New York, N. Y
Strype, Fred C., 140 Lafayette, New York, N. Y.
Taylor-Logan Co., Holyoke, Mass.
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Warren Parchment Co., Dexter, N. Y.
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Windsor Locks Paper Mills Co., Windsor Locks, Conn.

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Mitchell-Rand Mfg. Co., 19 Vesey, New York, N. Y.
National Vulcanized Fibre Co., Wilmington, Del.
Standard Fibre Products Co., 36 Pleasant, Watertown, Mass.
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PENS, Scorching
Gilbert Supply Co., Independence, Iowa.
Little Speedazer. See Gilbert Supply Co.
Post Elec. Co., 7 E. 44th, New York, N. Y.
Stylectric. See Post Electric Co.

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American Perforator Co., 617 W. Jackson, Chicago, Ill
Asam Bros., 917 Arch, Philadelphia, Pa.
Asam Wright. See Asam Bros.
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Scovil Mfg. Co., Waterbury, Conn.
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Foto Cell. See Raytheon Mfg. Co.
General Electric Co., Schenectady, N. Y.
G-M Laboratories, Inc., Grace & Ravenswood Ave., Chicago.
Kino-Lamp. See Raytheon Mfg. Co.
National Carbon Co., New York, N. Y.
Photion Instrument Corp., 574 Southern Blvd., New York.
Radio Elec'l Wks., 150 W. 22nd, New York, N. Y.
Visitron. See G-M Laboratories, Inc.
Westinghouse Elec. & Mfg. Co., Mansfield, Ohio

PHOTOMETERS, Lamp Testing
Biddle, James G., 1211 Arch, Philadelphia, Pa.
Foote, Pierson & Co., 75 Hudson, Newark, N. J.
Holophane Co., 342 Madison Ave., New York, N. Y.
Leeds & Northrup Co., 4901 Stenton Ave., Philadelphia, Pa
Luxometer. See James G. Biddle.
Mathews. See Foote, Pierson & Co.
National Lamp Wks of G. E. Co., Cleveland, O.

PICK-UPS, TALKING MACHINE. See Loud Speakers.

PIGTAILS, Commutator. See Brushes, Commutator.
Wire Gauze. See Brushes, Commutator.
Vacuum Cleaner. See Brushes for Vacuum Cleaners

PINIONS. See Gears and Pinions.
PINION PULLERS. See Pullers, Armature Shaft.
PLASTICS. See Molded Insulation.
PLATES, Name. See Name Plates: Also Decalcomania
Fixture Outlets. See Fixture Fittings.
Storage Battery. See Plates, Storage Battery

Gray Instrument Co., 64½ W. Johnson, Philadelphia, Pa.

PLATES, Storage Battery
Ara Elec'l Corp., 211 E. Columbia, Fort Wayne, Ind.
Champion. See Englert Mfg. Co.
C. & B. Battery Co., 1535 S. State, Chicago, Ill.
Edes Mfg. Co., Plymouth, Mass.
Englert Mfg. Co., 2500 Jane, Pittsburgh, Pa.
Esto. See New Jersey Storage Battery Co.
Fort Wayne Battery Mfg. Co., 230 E. Fourth, Ft. Wayne.
Handler. See Witherbee Storage Battery Co.
Link & Hemrick, Inc., 555 W. 52nd St., New York, N. Y.
New Jersey Storage Battery Co., 656 Summit Ave., Union City, N. J.
Universal Battery Co., 3410 S. La Salle, Chicago, Ill.
Witherbee Storage Battery Co., 75 Columbus Ave., New York.

PLATING GENERATORS
American Giant. See Connecticut Dynamo Motor Co.
Bogue Elec. Co., Chas. J., 132 King, New York, N. Y.
Burke Elec. Co., Erie, Pa.
Century Electric Co., 1806 Pine, St. Louis, Mo.
Chandeysson Elec. Co., St. Louis, Mo
Columbia Elec. Mfg. Co., 1293 E. 53rd, Cleveland, Ohio.
Connecticut Dynamox Motor Co., Irvington, N. J.
Conpro. See Eager Elec. Co.
Eager Electric Co., 522 Newell, Watertown, N. Y.
Eclipse. See Fidelity Elec. Co.
Electric Specialty Co., 229 South, Stamford, Conn.
Esco. See Electric Speciality Co.
Fidelity Elec. Co., Lancaster, Pa.
Hanson-Van Winkle-Munning Co., Matawan, N. J.
Hobart Bros. Co., Troy, O.
Holtzer-Cabot Elec. Co., 125 Amory, Boston, Mass.
Ideal Electric & Mfg. Co., East Third St., Mansfield, O.
Jantz & Leist Elec. Co., Cincinnati, O.
Kendrick & Davis Co., Lebanon, N. H.
L'Hommedieu & Sons Co., Chas. F., 4521 Ogden Ave., Chicago Ill.
Optimus. See Hanson-Van Winkle & Munning Co.
Reliance See L'Hommedieu & Sons Co., Chas. F
Roth Bros. & Co., Div. of Century Electric Co., 1400 W. Adams, Chicago, Ill.
Westinghouse Elec. Mfg. Co., East Pittsburgh, Pa.

PLATING AND FINISHING
Chromium Plating, Rust Proofing and other special metal-finishing processes.
Amalgy. See American Machine & Foundry Co.
American Machine & Foundry Co., 5520 Second Ave., Brooklyn, N. Y.
Atlantic Chemical Co., Colt, Irvington, N. J.
Chromalite. See Metals Protection Corp.
Diamond Chrome. See U. S. Chromium Corp.
Duro Chrome. See General Chromium Corp.
General Chromium Corp., 3220 Bellevue Ave., Detroit, Mich (Chromium Plate.)
Ideal Plating & Polishing Co., 55 Branford, Newark, N. J.
Metals Coating Co. of America, 495 N. Third, Philadelphia, Pa.
Metals Protection Corp., 401 Michigan, Indianapolis, Ind.
Parker Rust-Proof Co., 2177 E. Milwaukee, Detroit, Mich.
Rochester Elec. Products Corp., 89 Allen, Rochester, N. Y.
United Chromium, Inc., 51 E. 42d, New York, N. Y
Udylite Process Co., 3220 Bellevue Ave., Detroit, Mich. (Rust-Proof Finish)
U. S. Chromium Corp., Wilkinsburg Sta., Pittsburgh, Pa.

PLATINUM.
Sheet, Rod, Tubing, Wire.
American Platinum Wks., 241 New Jersey Railroad Ave., Newark, N. J.
Baker & Co., Inc., 54 Austin, Newark, N. J.
Coffin Mfg. Co., B. F., 30 Court, Newark, N. J.

Interstate Products Corp., 29 Commercial, Newark, N. J.
Wilco. See H. A. Wilson Co.
Wildberg Bros., Smelting & Refining Co., 742 Market, San Francisco, Cal.
Wilson Co., H. A., Newark, N. J.

PLUG FUSES. See Fuses and Fuse Wire.
PLUG RECEPTACLES. See Receptacles, Plug.
PLUGS, Flashing. See Flashers, Sign.
PLUGS, Radio. See Radio Receiver Parts.

PLUGS, Attachment
A-1 Bakelite. See Connecticut Elec. Mfg. Co.
Ajax Elec. Specialty Co., 1926 Chestnut, St. Louis, Mo.
Alcor Mfg. Co., 4605 W. Madison, Chicago.
Anselite Elec. Mfg. Co., New Haven, Conn.
Anylite Elec. Co., Fort Wayne, Ind.
Arrow Electric Div. of Arrow-Hart & Hegeman Elec. Co., Hartford, Conn.
Arro-Grip. See Arrow Elec.
Beardsley & Wolcott Mfg. Co., Waterbury, Conn.
Beaver Mfg. Co., 625 N. Third, Newark, N. J.
Bee-Ell Elec. Mfg. Co., 79 Mercer, New York, N. Y.
Belden Mfg. Co., 2310 B. S. Western Ave., Chicago, Ill. (Special Soft Rubber Plug Furnished with Belden Cords).
Benjamin Elec. Mfg. Co., Des Plaines, Ill.
Bryant Elec. Co., Bridgeport.
C. H. See Cutler-Hammer Mfg. Co.
Carling Tool & Machine Co., 32 Union Place, Hartford Conn.
Cemco. See Connecticut Elec. Mfg. Co.
Circle F Mfg. Co., Trenton, N. J.
Colt's Patent Fire Arms Mfg. Co., Hartford, Conn.
Connecticut Elec. Mfg. Co., Bridgeport, Conn.
Cutler-Hammer, Inc., 1288 St. Paul Ave., Milwaukee.
Deal Electric Co., 453 Broome, New York, N. Y.
Diamond, H. See Hart Mfg. Co.
Dreadnaught. See Cutler-Hammer Mfg. Co.
Eagle Elec. Mfg. Co., 79 Hall, Brooklyn, N. Y.
Eastman Mfg. Co., Manitowoc, Wis.
Edison Electric Appliance Co., 5618 W. Taylor, Chicago, Ill.
Electric Co., 94 Allyn, Hartford, Conn.
Ericson Mfg. Co., 3257 Bradford Rd., Cleveland, O.
Esler Elec. Mfg. Co., 802 S. Adams, Marion, Ind.
York, N. Y.
Fitzall. See Rodale Mfg. Co.
Gaynor Electric Co., Inc., Stratford, Conn.
GE-Flex. See General Electric Co.
General Electric Co., Bridgeport, Conn. (Special Soft Rubber Plug Furnished with G. E. Cords.)
Globe Metal Mfg. Co., 2122 E. Hazzard, Philadelphia, Pa.
Gold Seal Elecl. Co. of Ohio, Inc., 250 Park Ave., New
Gripall. See Beaver Mfg. Co.
Handle Cap. See Beaver Mfg. Co.
Hart Mfg. Co., Hartford, Conn.
Hart & Hegeman, Div. of Arrow-Hart & Hegeman Elec. Co., Hartford, Conn.
Heatach. See Marks Products Co.
Hemco. See Bryant Electric Co.
Hoosick Falls Radio & Electrical Parts Mfg. Co., Hoosick Falls, N. Y.
H. & H. See Hart & Hegeman.
Hubbell, Inc., Harvey, Bridgeport, Conn.
Iffy. See Esler Elec. Mfg. Co.
Kool Plug. See Colt's Patent Fire Arms Mfg. Co.
Lewiton Mfg. Co., 226 Newell, Brooklyn, N. Y.
Marks Products Co., 23 E. 16th, New York.
Metropolitan Electric Mfg. Co., Blvd. at 14th St., Long Island City, N. Y.
Nelco. See Nelson Elec. Co.
Nelson Elec. Co., Plant City, Fla.
P. & S. See Pass & Seymour.
Paragon Elec. Sales Co., 215 S. Fifth, Philadelphia, Pa.
Pass & Seymour, Solvay Sta., Syracuse, N. Y.
Quartap. See Connecticut Elec. Mfg. Co.
Poloron Elec. Mfg. Co., 20 Bond, New York, N. Y.
Propp Co., M., 524 Broadway, New York.
Quick Catch. See Hubbell, Inc., Harvey.
Real. See Smith & Co., T. C.
Real Diamond. See Smith & Co., T. C.
Reben Electric Mfg. Co., 2034 Gravesend Ave., Brooklyn N. Y.
Reneo. See Reben Elec. Mfg. Co.
Reynolds Spring Co., Jackson, Mich.
Reynolite Masterpiece. See Reynolds Spring Co.
Ripple. See Bryant Elec. Co.
Rodale Mfg. Co., 200 Hudson, New York.
Safegard Elec. Appliance Co., 133 S. Twelfth, Philadelphia.
Samson Cutlery Co., 8 Jones, Rochester, N. Y.
Sears, Henry D., 30 Boylston, Boston 11, Mass.
Smith & Co., T. C., 3915 Powelton Ave., Philadelphia, Pa.
Snapit. See Marks Products Co.
Snoco. See Snow & Co., E. W
Snow & Co., E. W., Rochester, N. Y.
Spartanette. See Bryant Elec. Co.
Spar Tap. See Bryant Elec. Co.
Speedway Elec. Mfg. Co., 30 Church, New York, N. Y.
Standard. See Cutler-Hammer Mfg. Co.
Sultzall. See Beaver Mfg. Co.
Surefit. See Alcor Mfg. Co.
T. E. C. See Electric Co.
Tedco. See Paragon Elec. Sales Co.
Telitale Tap. See General Elec. Co.
Templus. See Bryant Elec. Co.
Torrid. See Beardsley & Wolcott Mfg. Co.
Trio-Tap. See Rodale Mfg. Co.
Triple Tap. See General Elec. Co.
Twin Tap. See General Elec. Co.
United States Elec. Mfg. Co., 222 W. 14th, New York.
Un-X-Ld. See Speedway Elec'l Mfg. Co.
Utilo Mfg. Co., 320 E. Liberty, Lancaster, Pa.
Weber. See Sears, Henry D.
Wellmade Elec. Mfg. Co., Torrington, Conn.
Wilshires. See Ions Co.
Yankee. See Beaver Mfg. Co.

POCKET METERS. See Instruments, Pocket.

POINTS, Contact
American Platinum Wks., 241 New Jersey Railroad Ave., Newark, N. J.
Baker & Co., Inc., 54 Austin, Newark, N. J. (Gold, Platinum, Silver.)
Coffin Mfg. Co., B. F., 30 Court, Newark, N. J. (Platinum and Silver.)
Cohn, Sigmund, 44 Gold, New York, N. Y. (Platinum.)
Elkon, Inc. (Div. of P. R. Mallory Co.), 350 Madison Ave., New York, N. Y.
Fansteel Products Co., North Chicago, Ill.
Hardy Metal Corp., Seattle, Wash.
Hart & Hegeman, Div. of Arrow-Hart & Hegeman Elec. Co., Hartford, Conn.
Independent Contact Mfg. Co., 545 39th, Union City, N. J. (Tungsten.)
Interstate Products Corp., 29 Commercial, Newark, N. J. (Platinum and Silver.)
National Contact Co., 32 W. 60th, New York. (Platinum.)
Niehoff & Co., C. E., 230 W. Superior, Chicago. (Platinum.)
Spark-O-Metal. See Hardy Metal Corp.
Wilco. See Wilson Co., H. A.
Wilson Co., H. A., Newark, N. J. (Platinum and Silver.)

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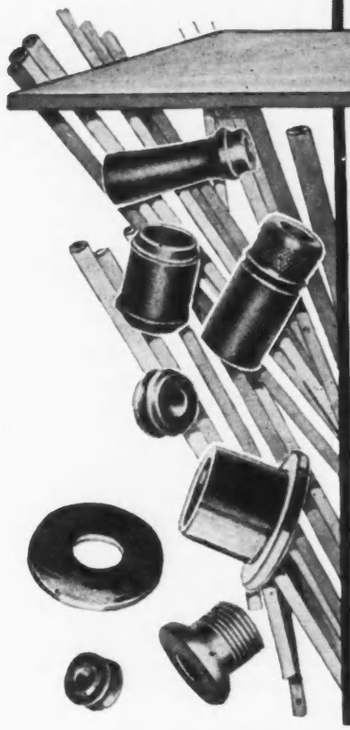

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POLARITY INDICATORS. See Instruments, Pocket.
POLISHING MACHINES, WIRE. See Wire Polishing Machines.

PORCELAIN
Bushings. See Bushings, Box & Cabinet.
Liquid. See Cement, Liquid Porcelain.
Molding Machine. See Presses, Porcelain Molding.
Reflectors (Enameled). See Reflectors, Porcelain Enameled.
Refractory. See Cores, Resistance Coil.

PORCELAIN, Special Shapes
Akron Porcelain Co., Akron, Ohio.
American Porcelain Co., E. Liverpool, O.
A. P. See Akron Porcelain Co.
Burgess & Co., East Liverpool, O.
Central Porcelain Co., Columbiana, O.
Circle F Mfg. Co., Trenton, N. J.
Colonial Insulator Co., Akron, O.
Connecticut Porcelain Co., Trenton, N. J.
Cook Pottery Co., Trenton, N. J.
Corns China Co., Wellsville, O.
Crowley & Co., Henry L., 545 N. Arlington Ave., East Orange, N. J.
Electrical Refractories Co., East Palestine, O.
Globe Porcelain Co., Mulberry St. and St. Joes Ave., Trenton, N. J.
Hartford Faience Co., Hartford, Conn.
Hub-Way Mfg. Co., Hubbard, Ohio.
Illinois Electric Porcelain Co., Macomb, Ill.
Imperial Porcelain Wks., Canal and Mulberry, Trenton, N. J.
Knox Porcelain Corp., Knoxville, Tenn.
Louthan Mfg. Co., East Liverpool, O.
Mercer Porcelain Co., Trenton, N. J.
Metsch Refractories Co., East Liverpool, Ohio.
National Porcelain Co., Trenton, N. J.
New Jersey Porcelain Co., Trenton, N. J.
Nu Blac. See Star Porcelain Co.
Pass & Seymour, Inc., Solvay Sta., Syracuse, N. Y
Porcelava. See Burgess & Co.
Porcelain Products, Inc., Findlay, Ohio.
Square D Company, Detroit, Mich.
Standard & Specialty Porcelain Co., Sun Prairie, Wis
Star Porcelain Co., Muirhead St., Trenton, N. J
Stupakoff Laboratories, 6627 Hamilton Ave., Pittsburgh, Pa.
Thomas & Sons Co., R., Lisbon, O.
Trenle Porcelain Co., East Liverpool, Ohio.
Union Elec'l Porcelain Wks., Inc., Trenton, N. J.
Washington Porcelain Co., Washington, N. J.

POROUS CUPS
Unglazed earthenware cups for primary (wet) batteries.
Colonial Insulator Co., Akron, Ohio.
Maddocks Sons, John, Trenton, N. J.
Ohio Pottery Co., Zanesville, Ohio.
Robinson Clay Products Co., Akron, Ohio.

POSTS, Binding
Binding Posts, Switch Parts, Stop Points, Contacts, Arms, Levers. See also Radio Mountings.
American Radio Hardware Co., 135 Grand, New York
Bunnell & Co., J. H., 32 Park Pl., New York, N. Y.
Chapman Machine Co., Terryville, Conn.
Chase Brass & Copper Co., Waterbury, Conn.
DeJur-Amsco Corp., 418 Broome, New York, N. Y.
Eby Mfg. Co., Inc., H. H., 4710 Stenton Ave., Philadelphia, Pa.
Ensign. See Eby Mfg. Co., H. H.
Eureka. See Frank W. Morse Co.
Grammes & Sons, Inc., L. F., Allentown, Pa.
Gray Bros., Piano, Ill.
Hart & Hegeman, Div. of Arrow-Hart & Hegeman Elec. Co., Hartford, Conn.
Hoosick Falls Radio & Electrical Parts Mfg. Co., Hoosick Falls, N. Y.
King. See Morse Co., Frank W.
Morse Co., Frank W., 289 Congress, Boston. (Spring Grip Nutmeg. See Hart & Hegeman, Div. of Arrow-Hart & Hegeman Elec. Co.
Polk, J. L., 41 Bell Ave., Troy, N. Y.
Premier Elec. Co., 3800 Ravenswood Ave., Chicago, Ill.
Quality. See H. H. Eby Mfg. Co.
Queen. See Morse Co., Frank W.
Thomaston Mfg. Co., Thomaston, Conn.
Waterbury Button & Moulding Co., Waterbury, Conn.
POTENTIOMETERS (Instruments). See Instruments, Laboratory Standard.
POTENTIOMETERS (Radio Control). See Radio Receiver Parts.
POWDERED CARBON. See Carbon, Powdered.
POWER TRANSMISSION CHAIN. See Chain, Power Transmission.
PRESS BOARD. See Cloth and Paper.

PRESSES, Armature Coil
Comstock Mfg. Co., Wilkes-Barre, Pa.
PRESSES, ARMATURE NOTCHING. See Notching Machines, Armature.

PRESSES, Molded Insulation
Burroughs Co., 246 N. Tenth, Newark, N. J.
Dunning & Boschert Press Co., 329 W. Water, Syracuse
Elmes Engrg. Works, Chas. F., 230 N. Morgan, Chicago
Evans Engrg. Works, Chas. E., 1002 Fulton, Chicago, Ill
Farquhar Co., A. B., York, Pa.
French Oil Mill Machinery Co., Piqua, O.
Southwark Fdy. & Mach. Co., 400 Washington Ave., Philadelphia, Pa.
Stokes Mach. Co., F. J., 5834 Tabor Rd. (Olney), Philadelphia, Pa.
Terkelson Machine Co., 326 A, Boston, Mass.
Watson-Stillman Co., 75 West St., New York, N. Y
Wood & Co., R. D., Florence, N. J.

PRESSES, Porcelain Molding
Baird, Andrew, 2715 Newark, Detroit, Mich

PRESSES, Punching and Bending
Bench Presses—Power Presses; for Punching & Stamping Sheet Metal.
Ams Machine Co., Max, 101 Park Ave., New York, N. Y
Baird Machine Co., Bridgeport, Conn.
Bliss Co., E. W., 53rd St. & Second Ave., Brooklyn, N. Y
Federal Press Co., Elkhart, Ind.
Ferracute Machine Co., Bridgeton, N. J.
Hyro Mfg. Co., 200 Varick, New York, N. Y.
Leahbough-Jordan Tool & Machine Co., Elkhart, Ind.
Niagara Machine & Tool Wks., 637 Northland, Buffalo, N. Y.
Peck, Stow & Wilcox Co., Southington, Conn.
PRESSES, Stamping. See Presses, Punching & Bending.
Rockford Iron Works, 846 Ray, Rockford, Ill.
PRISMS, Chandelier. See Crystals, Chandelier
PROJECTOR LENSES. See Lenses.

PULLERS, Armature Shaft
Motor Pulley, Shaft & Pinion Pullers & Extractors
Allen Electric & Equipment Co., Kalamazoo, Mich.
Big Buster. See Premier Elec. Co.
Crane Puller Co., Waltham, Mass.
Columbia Machine Works & Malleable Iron Co., Atlantic Ave. & Chestnut St., Brooklyn, N. Y.
Duff Mfg. Company, Pittsburgh, Pa.
Electric Service Supplies Co., 17th & Cambria Sts Philadelphia, Pa.

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Little Giant. See Premier Elec. Co.
Peerless. See Electric Service Supplies Co.
Premier Electric Co., 3800 Ravenswood Ave., Chicago, Ill.
Weidenhoff, Joseph, 4352 Roosevelt Rd., Chicago, Ill.

PULLEYS, Composition
General Electric Co., Schenectady, N. Y.
Rockwood Mfg. Co., Indianapolis, Ind.
Sprucolite Co., Bloomfield, N. J.

PUMPS, Oil Burner
Janette Mfg. Co., 556 W. Monroe, Chicago, Ill.
Milwaukee Tank Wks., Milwaukee, Wis.
Monroe Machine Tool Co., 737 W. Jackson Blvd., Chicago
Reflex. See Simplex Oil Heating Co.
Simplex Oil Heating Co., 1199 Eddy, Providence, R. I.
Teesdale Mfg. Co., 427 Market, Grand Rapids, Mich.

PUMPS, Vacuum
To Exhaust Incandescent Lamps.
Beach-Russ Co., 50 Church, New York, N. Y.
Bishop & Babcock Sales Co., 4901 Hamilton Ave., N. E., Cleveland, O.
Cenco. See Central Scientific Co.
Central Scientific Co., 460 E. Ohio, Chicago, Ill.
Dunham Co., C. A., 450 East Ohio, Chicago, Ill.
Elmer & Amend, 205 3rd Ave., New York, N. Y.
Eisler Elec. Corp., 756 S. 13th, Newark, N. J.
General Electric Co., Schenectady, N. Y.
Hubbard's Sons, Norman, 1 Carlton Ave., Brooklyn, N. Y.
Leiman Bros., 23 Walker, New York, N. Y.
Megavac. See Central Scientific Co.
Packard. See Hubbard's Sons, Norman.

PUNCHING PRESSES. See Presses, Punching.

PUNCHING and BENDING, Sheet Steel
Anderson Mfg. Co., Albert & J. M., 289 A, Boston, Mass.

RACKS, Wire Reel
(With Tension Device Attached).
Armature Coil Equipment Co., 2415 Forestdale Ave., Cleveland, Ohio.
Browning. See Mutual Foundry & Machine Co.
Chapman Elec'l Wks., P. E., 1826 Chouteau Ave., St. Louis, Mo. (Tensionless Dereeler)
Columbia Machine Tool Works & Malleable Iron Co., Atlantic Ave. and Chestnut St., Brooklyn, N. Y.
Comstock Mfg. Co., Wilkes-Barre, Pa.
Electric Service Supplies Co., 17th & Cambria Sts., Philadelphia, Pa.
General Elec. Co., Schenectady, N. Y. (Tension Indicator.)
Mutual Foundry & Machine Co., Atlanta, Georgia.
Segur. See Electric Service Supplies Co.

RADIO CIRCUIT COMPONENTS
This heading includes Inductances (Coils), Capacitors (Condensers), Fixed Resistances, Grid Leaks, Transformers, Choke Coils, and Filters, also Amplifier Units and Kits.
Acme Appar. Corp., 39 Osborne, Cambridge, Mass.
Acme Products Co., Boston, Mass.
Acme Wire Co., New Haven, Conn.
Aero-Call. See Aero Products, Inc.
Aerovox Wireless Corp., 80 Washington, Brooklyn, N. Y.
Aero Products, Inc., 4611 Ravenswood Ave., Chicago, Ill.
Air-King Products Co., 216 Wallabout, Brooklyn, N. Y.
Ajax Elec. Specialty Co., St. Louis, Mo.
Akra-Ohm. See Shallcross Mfg. Co.
Alden Mfg. Co., Springfield, Mass.
All-American Mohawk Corp., 4201 Belmont Ave., Chicago.
Allen-Bradley Co., 494 Reed, Milwaukee, Wis.
Amerchoke. See American Transformer Co.
American Apparatus Co., Richmond, Ind.
American Specialty Mfg. Co., 165 Holland Ave., Bridgeport, Conn.
American Transformer Co., Newark, N. J
Amperite Rheostat. See Radiall Co.
Arco Elec'l Corp., 211 E. Columbia, Fort Wayne, Ind.
Arctic. See Premier Elec. Co.
Art Dial. See Pilot Radio & Tube Corp.
Audioformer Transformer. See Pacent Electric Co.
Autoformer. See Thordarson Elec. Mfg. Co.
Automatic Oil Heat Co., 9294 E. Fourth, St. Paul, Minn.
Automotive Parts Mfg. Co., 70 Washington St., Brooklyn,
B-Conomizer. See Pilot Radio & Tube Corp.
Benjamin Elec. Mfg. Co., Des Plaines, Ill.
Bonine. See Turn-it Radio Sales.
Branston Co., Chas. A., 297 Washington, Buffalo, N. Y.
Brooklyn Metal Stamping Corp., 718 Atlantic Ave., Brooklyn, N. Y.
Browning-Drake Corp., Calvary, Waltham, Mass.
Buffer. See Aerovox Wireless Corp.
Buffalo. See De Jur-Amsco Corp.
Camfield. See Columbia Metal Products Co.
Campbell Electric Mfg. Co., 15 Stewart, Lynn, Mass.
Capacigrad. See Pilot Radio & Tube Corp.
Cardwell Mfg. Corp., Allen D., 81 Prospect, Brooklyn, N. Y.
Carter Mfg. Co., 6300 Euclid Blvd., East Cleveland, O.
Carter Radio Co., 407 S. Aberdeen, Chicago, Ill.
Central Radio Corp., Beloit, Wis.
Centraline. See Pilot Radio & Tube Corp.
Certified Condenser. See Radio Condenser Co.
Chelten Elec. Co., 4859 Stenton Ave., Philadelphia, Pa.
Chicago-Jefferson Fuse & Elec. Co., 1505 W. 15th, Chicago.
Clarostat Mfg. Co., 281 N. Sixth, Brooklyn, N. Y. (Radio Resistance.)
Cole Radio Mfg. Corp., 536 Bloomfield Ave., Bloomfield, N. J
Columbia Metal Products Co., 360 E. Grand Ave., Chicago.
Concertone. See Chicago-Jefferson Fuse.
Connectoralds. See Alden Mfg. Co.

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Continental Carbon, Inc., Cleveland, O.
Continental. See Gardiner & Hepburn, Inc.
Cornell Elec. & Mfg. Co., Anable & Rawson, Long Island City, N. Y.
Cresradio Corp., 166-32 Jamaica Ave., Jamaica, N. Y.
Cretot. See Premier Elec. Co.
Cub. See Cornell Electric & Mfg. Co.
Daven Co., 158 Summit, Newark, N. J. (Kits)
Davohn. See Daven Co.
DeForest Radio Co., Jersey City, N. J.
De Jur-Amsco Corp., 418 Broome, New York, N. Y.
Diamond Weave Coil. See Sickles Co., F. W.
Dongan Elec. Mfg. Co., 2985 Franklin, Detroit, Mich.
Dubilier Condenser Corp., 342 Madison av., New York
Dumont Elec. Co., 40 W. 17th, New York, N. Y.
Duratran. See Dubilier Condenser Corp.
Durham & Co., 1936 Market, Philadelphia, Pa.
Dymac. See Electrical Products Mfg. Co.
Dynohmic. See Lynch, Inc.
Eagle Elec. Mfg. Co., 79 Hall, Brooklyn, N. Y.
Electrad, Inc., 175 Varick, New York, N. Y.
Electrical Products Mfg. Co., Providence, R. I. (Kit.)
Electrical Research Laboratories, 2500 Cottage Grove Ave., Chicago, Ill.
Electro Motive Engineering Corp., 127 W. 17th, New York
Elkay. See Langbein Kaufman Radio Co.
Elkon, Inc., 350 Madison Ave., New York, N. Y.
El Menco. See Electro Motive Engineering Co.
Equamatic Kits. See Karas Elec. Co.
Equitrol. See Cardwell Mfg. Corp.
E-Z. See Polymet Mfg. Corp.
Faradon. See Wireless Specialty Apparatus Co.
Fast Co., John E., 3982 Barry Ave., Chicago, Ill.
Ferranti, Inc., 130 W. 42nd, New York, N. Y.
Filatrol. See De Jur-Amsco Corp,
Filterettes. See Tobe Deutschmann Co.
Filtrola. See All-American Mohawk Corp.
Flechtheim Co., A. M., 136 Liberty, New York, N. Y.
Ford Radio & Mica Corp., 113 Bleecker, New York, N. Y.
Frost, Inc., Herbert H., 1142 W. Beardsley, Elkhart, Ind
F. & H. Radio Laboratories, Fargo, N. D.
Gardiner & Hepburn, Inc., 611 Widener Bldg., Philadelphia, Pa.
General Instrument Corp., 225 Varick, New York, N. Y.
General Radio Co., 30 State, Cambridge, Mass.
General Transformer Corp., 910 W. Jackson Blvd., Chicago
General Winding Co., 214 Fulton, New York, N. Y.
Gen-Win. See General Winding Co.
Ger-Alt Radio Laboratories, 859 Flatbush Ave., Brooklyn, N. Y. (Adapter.)
Glastor. See Daven Co.
Globar Corp., Niagara Falls, N. Y.
Glo-Dial. See Wireless Radio Corp.
Gray & Danielson Mfg. Co., 260 1st, San Francisco, Cal.
Halldorsen Co., 4745 N. Western Ave., Chicago, Ill.
Hamilton-Sangamo Corp.
Hammarlund Mfg. Co., 424 W. 33rd, New York, N. Y.
Hardwick, Hindle, Inc., 122 Greenwich, New York, N. Y.
Harmonik. See Karas Elec. Co.
Hart & Hegeman, Div. of Arrow-Hart & Hegeman Elec. Co., Hartford, Conn. (TRF Kits.)
Hedgehog Transformer. See Premier Elec. Co.
Heinemann Elec. Co., Trenton, N. J.
Held-Tite, Hi-ohm, Hi-pot. See Carter Radio Co.
Hi-Q Kit. See Hammarlund.
Hum-Dinger. See Clarostat Mfg. Co.
Hy-Wat. See Electro Motive Engineering Corp.
Igrad Condenser & Mfg. Co., 4322 Lake Ave., Rochester, N. Y.
Intra-Lyne. See Gray & Danielson Co.
International Resistance Co., 2006 Chestnut, Philadelphia, Pa
Isograd, Isoleak. See Pilot Radio & Tube Corp.
J-M-P. Mfg. Co., 3320 Fond du Lac Ave., Milwaukee, Wis
Karas Elec. Co., 4040 N. Rockwell, Chicago, Ill.
Kelford. See American Specialty Co.
Kenyon Transformer Co., 122 Cypress Ave., New York, N. Y.
Kilograd. See Pilot Radio & Tube Corp.
Krobiack. See Mountford, C. E.
Kuprox. See Kodel Radio Corp.
Langbein-Kaufman Radio Co., 62 Franklin, New Haven, Conn
Lavite. See Aerovox Wireles Corp.
Lautz Mfg. Co., 245 N. J. R. R. Ave., Newark, N. J (Radio Resistance).
Leakandenser. See Daven Co.
Lekeless. See Benjamin Elec. Mfg. Co.
Lemnis. See General Winding Co.
L. M. C. See Lautz Mfg. Co.
Loftin-White. See Hammarlund Mfg. Co.
Loless. See Wireless Radio Corp.
Lynch, Arthur H., 1775 Broadway, New York, N. Y.
Marco. See Martin-Copeland Co.
Martin-Copeland Co., 101 Sabin, Providence, R. I.
Maxitran. See Electrical Research Laboratories.
Mayolian Corp., 1668 Webster Ave., New York, N. Y. (Tone Filter.)
Meggit. See Cole Mfg. Corp.
Melco-Supreme. See De Jur-Amsco Corp.
Melcoupler. See Robertson-Davis Co.
Meloformer. See Robertson-Davis Co.
Metaleak. See Dubilier Condenser Corp.
Metralign. See General Instrument Corp.
Micadon Condenser. See Dubilier Condenser Corp.
Micamold Radio Corp., 1087 Flushing Ave., Brooklyn, N. Y. (Amplifier Kits.)
Mica-Static. See Dubilier Condenser Corp.
Micon Condenser. See Dubilier Condenser Corp.
Microcondenser. See Sterling Mfg. Co.
Microgrid. See Pilot Radio & Tube Corp.
Micrometric. See Karas Elec. Co.
Microstat. See Premier Elec. Co.
Midline. See Hammarlund Mfg. Co.
Modern Electric Mfg. Co., Toledo, O.
Mountford, C. E., 30 Sullivan, New York, N. Y.
Muter Co., Leslie F., 3440 S. Chicago Ave., Chicago, Ill. (Amplifier Kits.)
National Co., 61 Sherman St., Malden, Mass.
Neutro-Grad. See Pilot Radio & Tube Corp.
New York Coil Co., Mount Clare, Pa.
Nutmeg. See Hart & Hegeman Mfg. Co.
Ohio Carbon Co., 8215 Almira Ave., Cleveland, O.
Ohmite Mfg. Co., 642 N. Albany Ave., Chicago, Ill. (Resistance.)
One Way. See Carter Radio Co.
Orthometric. See Karas Elec. Co.
Orthophone. See De Jur-Amsco Corp.
Pacent Electric Co., 91 7th Ave., New York, N. Y.
Pam. See Samson Elec. Co.
Panatrol See Wireless Radio Corp.
Perry Elec'l Resistor Corp., 280 New Main St., Yonkers, N. Y.
Phasatrol. See Electrad, Inc.
Philmore Mfg. Co., 106 7th Ave., New York, N. Y.
Plander. See De Jur-Amsco Corp.
Pierce Airo. See United Scientific Laboratories.
Pilot Radio & Tube Corp., 323 Berry, Brooklyn, N. Y.
Pilotran. See Pilot Radio & Tube Corp.
Potter Mfg. Co., North Chicago, Ill.
Polymet Mfg. Corp., 829 E. 134th St., New York, N. Y.
Power Box. See Scott Sales Co.
Powerohm. See International Resistance Co.
Powrad, Inc., 121 Ingraham, Brooklyn, N. Y.
Precision Coil Co., 122 Greenwich, New York, N. Y.
Precise Mfg. Corp., 254 Mill, Rochester, N. Y.
Premier Elec. Co., 3800 Ravenswood Ave., Chicago, Ill.

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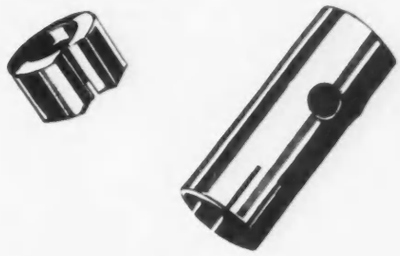

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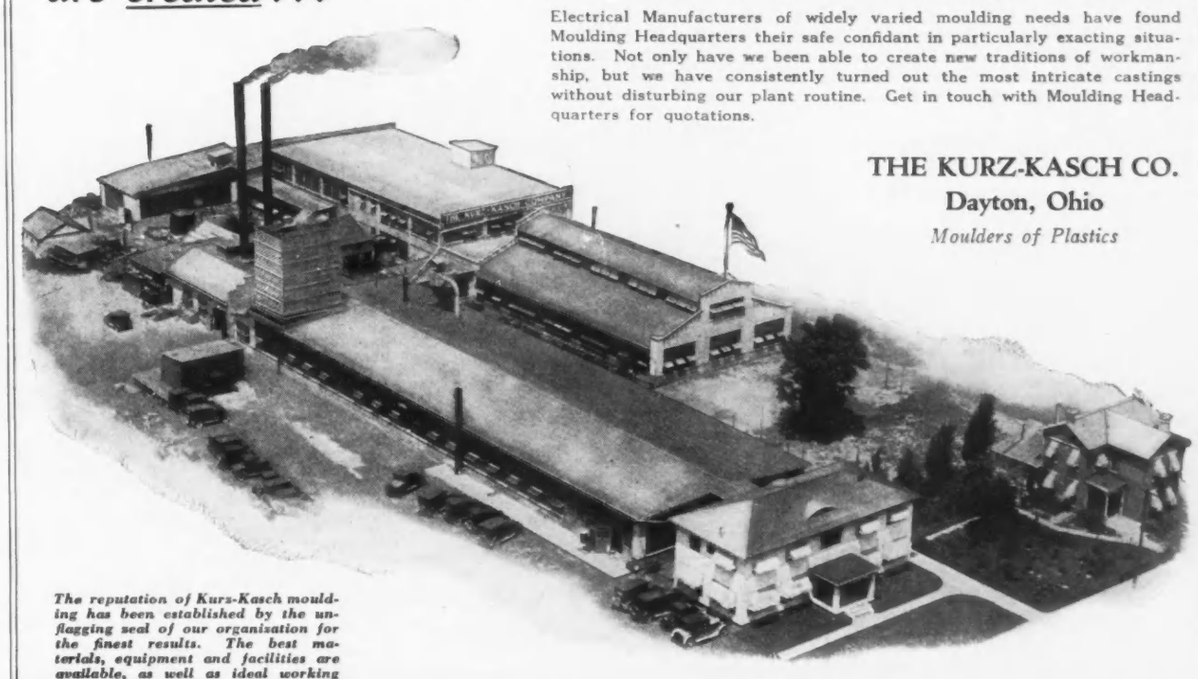

The reputation of Kurz-Kasch moulding has been established by the unflagging zeal of our organization for the finest results. The best materials, equipment and facilities are available, as well as ideal working conditions.

RADIO CIRCUIT COMPONENTS—Continued
Protectoraid. See Alden Mfg. Co.
Pyrohm. See Aerovox Wireless Corp.
Radiall Co., 50 Franklin, New York, N. Y.
Radio Appliance Corp., Springfield, Mass.
Radio Condenser Co., Thorn & Copewood, Camden, N. J.
Radio Engrg. Laboratories, 100 Wilbur Ave., Long Island City, N. Y. (Short Wave Kit.)
Radioloc Switch. See Cutler-Hammer Mfg. Co.
Radio Receptor Co., 106 7th Ave., New York.
Radiostat. See Allen-Bradley Co.
Raola. See Modern Elec. Mfg. Co.
Rauland-Lyric. See All American Mohawk Corp.
Receptrad. See Radio Receptor Co.
Reesonator. See F. & H. Radio Laboratories.
Regal. See American Specialty Mfg. Co.
Reliable Parts Mfg. Co., Wellington, O.
Remler. See Gray & Danielson Co.
Resistaformer. See Aerovox Wireless Corp.
Resistograd. See Pilot Radio & Tube Corp.
Rittenhouse Co., A. E., Honeoye Falls, N. Y. (Sole Selling Agent), Hatheway & Co., 16 Hudson, New York, N. Y.
Roberts Condenser. See Hammarlund Mfg. Co.
Robertson-Davis Co., 412 Orleans, Chicago, Ill.
Samson Elec. Co., Canton, Mass. (TRF Kits.)
Scovill Mfg. Co., Waterbury, Conn.
Senior. See All American Mohawk Corp.
Sensory. See Heinemann Electric Co.
Sevison Magneto Engr. Co., 397 Phillips, Toledo, O.
Shallcross Mfg. Co., 700 Parker Ave., Collingdale, Pa.
Sickles Co., F. W., 130 Union, Springfield, Mass.
Signal Elec. Mfg. Co., Menominee, Mich.
Silver-Marshall, Inc., 6401 W. 65th St., Chicago. (Amplifier Kits.)
Silvertone. See Radio Receptor Co.
S. L. S. See Wireless Radio Corp.
S. L. T. See General Instrument Corp.
Somersolo. See DeForest Radio Co.
Splitmeter. See Premier Electric Co.
Sprague Specialties Co., Dept. M., Quincy, Mass.
Standard Transformer Co., Warren, O.
Sta-Put. See Martin-Copeland Co.
Sterling Mfg. Co., 2831 Prospect Ave., Cleveland, O.
Stromberg-Carlson Tel. Mfg. Co., 1060 University Ave., Rochester, N. Y.
Submariner. See J-M-P Mfg. Co.
Super Multiformer. See Precise Mfg. Corp.
Supertran Transformer. See Ford Radio & Mica Co.
Symphony. See Modern Elec. Mfg. Co.
Syncrodenser. See Precise Mfg. Corp.
Telemonic Coil. See Condenser Corp. of America.
Telos Coil. See Condenser Corp. of America.
Thomas Engineering & Mfg. Co., 616 S. Michigan Ave., Chicago, Ill.
Thompson-Levering Co., 351 N. 57th, Philadelphia, Pa.
Thordarson Elec. Mfg. Co., Huron & Kingsbury Sts., Chicago
Tobe Deutschman Co., Canton, Mass.
Tone Control. See Sprague Specialties Co.
Torvid. See All American Mohawk Corp.
Transcontinental Coil Co., 5 Kirk Place, Newark, N. J.
Transcript-Clapp Kit. See Samson Electric Co.
Truphonic Amplification. See Alden Mfg. Co.
Tunadapta. See Lynch, Arthur H.
Tuway. See Carter Radio Co.
Twin-aud. See Peerless Radio Co.
Twin-Eight Transformers. See Bodine Electric Co.
Two-Ten & Two-Eleven. See Silver-Marshall.
Ultra Vario. See Bruno Radio Corp.
Universler Condenser. See Auburn Button Works
Universal Electro Chemical Corp., 30 W. 15th, New York
Universal Winding Co., Boston, Mass.
Valley Appliances, Inc., 634 Lexington Ave., Rochester, N. Y.
Variall Condenser. See Muter Co.
Volta. See Universal Electro Chemical Corp.
Volumgrad. See Pilot Radio & Tube Corp.
Walbert Radio Corp., 1000 Fullerton Ave., Chicago, Ill.
Waterbury Button & Moulding Co., Waterbury, Conn.
Wireless Radio Corp., Varick Ave. & Harrison Pl., Brooklyn, N. Y.
Wireless Specialty Apparatus Co. (J. P.), Boston, Mass

RADIO HARDWARE. See Radio Mountings.

RADIO MOUNTINGS

Coil Mountings, Coil Sliders and Rods, Switches, Detectors, Detector and Grid Leak Mountings, Panel Brackets, Special Radio Hardware & Trimmings, Metal Dials, Metal Panels etc.

Aerovox Wireless Corp., 50 Washington, Brooklyn, N. Y.
Alden Mfg. Co., Brockton, Mass.
American Emblem Co., Utica, N. Y.
American Radio Hardware Co., 135 Grand, New York
Bonza. See Haydon & Haydon.
Carborundum Co., Niagara Falls, N. Y. (Detector.)
Chapman Machine Co., Terryville, Conn.
De Jur-Amsco Corp., 418 Broome, New York, N. Y.
Durham & Co., 1936 Market, Philadelphia, Pa.
Electrad, Inc., 173 Varick, New York, N. Y.
Etched Products Corp., 90 Tenth, Long Island City, N. Y (Metal Panels.)
Eureka. See Morse Co Frank W.
General Etching & Mfg. Co., 3072 West Grand Ave., Chicago, Ill. (Metal Panels & Escutcheons.)
Globe Technolian Corp., Reading, Mass.
Glodial. See Wireless Radio Corp.
Hart & Hegeman Mfg. Co., Hartford, Conn.
Haydon & Haydon, 167 Chambers, New York, N. Y
Master Engineering Co., 122 S. Michigan Ave., Chicago, Ill.
Morse Co., Frank W., 291 Congress, Boston, Mass.
Muter Co., Leslie F., 8440 S. Chicago Ave., Chicago.
Na-Ald. See Alden Mfg. Co.
Union Insulating Co., 296 Broadway, New York, N. Y.
Waddell Mfg. Co., Grand Rapids, Mich.
Wireless Radio Corp., Varick Ave. & Harrison Pl., Brooklyn.
Yaxley Mfg. Co., 9 S. Clinton, Chicago, Ill.

RADIO PANEL ENGRAVING. See Engraving, Radio Panel.

RADIO RECEIVER PARTS

Rheostats, Sockets, Plugs, Jacks.

Acme Elec. & Mfg. Co., 1652 Rockwell, Cleveland, Ohio.
Alden Mfg. Co., Springfield, Mass.
Allen-Bradley Co., 494 Reed, Milwaukee, Wis.
Amacostat. See American Apparatus Co.
American Apparatus Co., Richmond, Ind.
American Specialty Mfg. Co., 165 Holland Ave., Bridgeport, Conn.
Automotive Equipment Co., 317 Halsey, Newark, N. J.
B. M. S. See Brooklyn Metal Stamping Corp.
Beaver Mfg. Co., 625 N. Third, Newark, N. J. (Multiple Plugs.)
Benjamin Elec. Mfg. Co., Des Plaines, Ill.
Brach Mfg. Corp., L. S., 120 Sussex Ave., Newark, N. J.
Brooklyn Metal Stamping Corp. 718 Atlantic Ave., Brooklyn
Cabelug. See Jones, Howard B.
Carter Radio Co., 407 S. Aberdeen, Chicago, Ill. (Also Socket Adapters.)
Central Radio Laboratories, 14 Keefe Ave., Milwaukee
Centralab. See Central Radio Laboratories.
Clarostat Mfg. Co., 285 N. Sixth, Brooklyn, N. Y.
Cle-Ra-Tone. See Benjamin Elec. Mfg. Co.
D. A. Radio Co., 30 Hollister, Buffalo, N. Y.
De Jur-Amsco Corp., 418 Broome, New York, N. Y.
De Veau. See Stanley & Patterson

Dongan Elec. Mfg. Co., 2555 Franklin, Detroit, Mich.
Duostat. See De Jur-Amsco Corp.
E-Z. See Polymet Mfg. Corp.
Eby Mfg. Co., H. H., 4710 Stenton Ave., Philadelphia, Pa.
Electrad, Inc., 173 Varick, New York, N. Y.
Electrical Products Mfg. Co., Providence, R. I.
Fantail Plug. See Brooklyn Metal Stamping Corp.
Frost, Herbert H., 1142 W. Beardsley, Elkhart, Ind
Gem-Jac. See Frost, Herbert H.
General Instrument Corp., 225 Varick, New York, N. Y.
General Radio Co., 30 State, Cambridge, Mass.
Gray & Danielson Mfg. Co., 260 First, San Francisco, Cal.
Hart & Hegeman, Div. of Arrow-Hart & Hegeman Elec. Co., Hartford, Conn.
Heinemann Elec. Co., Trenton, N. J.
Imp. See Carter Radio Co.
Jones, Howard B., 2300 Wabansia, Chicago. (Multiple Plug)
Klosner Radio Corp., 1023 E. 178th, New York, N. Y.
Martin-Copeland Co., 101 Sabin, Providence, R. I.
Microgrand. See Pilot Radio & Tube Corp.
Modu-Plug. See Central Radio Lab.
Morse Co., Frank W., 291 Congress, Boston, Mass.
Muter Co., Leslie F., 8440 S. Chicago Ave., Chicago.
Nutmeg. See Hart & Hegeman, Div. of Arrow-Hart & Hegeman Elec. Co.
Pacent Elec. Co., 91 Seventh Ave., New York, N. Y.
Pan-Tab Jack. See Frost, Herbert H.
Philmore Mfg. Co., 106 Seventh Ave., New York, N. Y
Pilot Radio & Tube Corp., 323 Berry, Brooklyn, N. Y.
Polymet Mfg. Corp., 829 E. 134th St., New York, N. Y.
Premier Elec. Co., 3800 Ravenswood Ave., Chicago, Ill.
Recto Mfg. Co., 23 W. Third, Cincinnati, Ohio
Robertson-Davis Co., 361 W. Superior, Chicago, Ill.
Royalty. See Electrad, Inc.
Samson Elec. Co., Canton, Mass.
Socostat. See D. A. Radio Co.
Stanley & Patterson, 150 Varick, New York, N. Y.
Sterling Mfg. Co., 2831 Prospect Ave., Cleveland, Ohio
Tubestat. See Muter Co.
Wireless Radio Corp., Varick Ave. & Harrison Pl., Brooklyn
Yaxley Mfg. Co., 9 S. Clinton, Chicago, Ill.

RADIO RECTIFIER TUBES

Armstrong Electric Co., 187 Sylvan Ave., Newark, N. J.
Arcturus Radio Tube Co., 260 Sherman Ave., Newark, N. J
Cable Radio Tube Corp., 80 N. Ninth, Brooklyn, N. Y.
Ceco Mfg. Co., 1200 Eddy, Providence, R. I.
Conneway Elec. Laboratories, 406 Jefferson, Hoboken, N. J
Cunningham, Inc., E. T., 470 Seventh Ave., New York, N. Y
Daven Co., 158 Summit, Newark, N. J.
DeForest Radio Co., Franklin St. & Central Ave., Jersey City, N. J.
Diamond Electric Co., Newark, N. J.
Diamond Vacuum Products Co., 4058 Diversey Ave., Chicago
Eveready Raytheon. See National Carbon Co.
Gold Seal Electrical Co. of Ohio, Inc., 250 Park Ave., New York, N. Y.
Hygrade Lamp Co., Salem, Mass.
Jaeger Research Laboratories, 280 Park Ave., Weehawken, N. J.
Ken-Rad Tube & Lamp Corp., Owensboro, Ky.
La Salle Radio Corp., Div. of Matchless Elec. Co., 1500 N. Ogden Ave., Chicago, Ill.
Manhattan Elect. Supply Co., 510 Sixth Ave., New York.
National Carbon Co., New York, N. Y.
National Radio Mfg. Co., 1020 S. Central Park Ave., Chicago, Ill.
Neptron. See Hygrade Lamp Co.
Northern Mfg. Co., 367 Ogden, Newark, N. J.
Paramount Mfg. Co., 79 Orange, Newark, N. J.
Perryman Electric Co., 4901 Hudson Blvd., North Bergen, N. J.
Radio-Victor Corp. of America, 233 Broadway, New York.
Specialty Appliance Co., 6611 Euclid Ave., Cleveland, Ohio.
Sylvania Products Co., Emporium, Pa.
Televocal Corp., 588 Twelfth, West New York, N. J.
United Radio & Elec. Corp., 500 Chancellor Ave., Irvington N. J.

RADIO TRANSFORMERS. See Radio Circuit Components

RADIO TUBE BASE BRANDERS. See Engraving Radio Panel.

RADIO TUBE BASES. See Radio Molded Parts.

RADIO TUBE BULBS (Unfinished). See Bulbs, Glass.

RADIO TUBE PARTS

Filament Hooks, Screens, Bolts & Nuts & Special Stampings.

Juno Fasteners, Inc., Hillside, N. J.

RADIO WIRING HARNESS

Special wiring cable and harness assemblies for radio battery connections, radio tube adapter harness for converting battery operated receivers to A.C. operation; Socket Adapters for Power Tubes; Loud Speaker Extension Cords—This heading also includes auto ignition assemblies.

Afco. See American Fabric Co.
Ajax Elec. Specialty Co., 1926 Chestnut, St. Louis, Mo.
Alden Mfg. Co., Brockton, Mass. (Adapters.)
Alpbus. See Alpha Radio Supply Co.
Alpha Radio Supply Co., 520 Broadway, New York, N. Y.
Alpetrand. See Alpha Radio Supply Co.
American Braiding Co., Holyoke, Mass.
Belden Mfg. Co., 2310B S. Western Ave., Chicago, Ill.
Birnbach Radio Co., 254 W. 31st St., New York, N. Y.
Blue Ribbon. See Crescent Braid Co.
Brach Mfg. Co., L. S., Newark, N. J.
Connectoralds. See Alden Mfg. Co.
Cornish Wire Co., 30 Church, New York, N. Y.
Corwico. See Cornish Wire Co.
Crescent Braid Co., Providence, R. I.
Crescent Insulated Wire & Cable Co., Trenton, N. J.
De Luxe, 50 W. Houston, New York, N. Y.
Diamond Braiding Mills, Chicago Heights, Ill.
Echo. See Cornish Wire Co.
Enterprise Mfg. Co., Third & Dauphin Sts., Philadelphia, Pa. (Adapters).
Frost, Inc., Herbert H., 1142 W. Beardsley, Elkhart, Ind (Adapters.)
Hatfield Rubber Wks., Inc., Hillside, N. J.
Lusterized. See American Braiding Co.
Manhattan Insulated Wire Co., 17 W. 60th St., New York.
Power, Inc., Harold J., Medford Hillside, Mass. (Adapters).
Radio Receptor Co., 106 Seventh Ave., New York, N. Y. (Adapters.)
Rigs. See Birnbach Radio Co.
Sterling Mfg. Co., 2831 Prospect Ave., Cleveland, Ohio. (Adapters).
Wilkens Mfg. Co., 52 Orawaupun St., White Plains, N. Y.

Gage List of
Electrical Buyers
The Trade Authority

RADIUM POWDER AND PAINT

Radium Dial Co., 3332 Forbes, Pittsburgh, Pa.
Undark. See United States Radium Corp.
United States Radium Corp., 535 Pearl, New York, N. Y.

RANGE SWITCHES, Rotary Snap. See Switches, Snap, Heavy Duty.

RAWHIDE GEARS. See Gears & Pinions, Rawhide.

READING LAMP BASES. See Bases, Reading Lamp.

REAMERS, Pipe. See Stocks, Dies and Reamers.

RECEPTACLES, Lamp. See Sockets and Receptacles.

RECEPTACLES, Plug, Heavy Duty

KEY

Battery Charging .....See B
Floor Boxes .....See F
Welding .....See W
Machine Tool .....See W
Watertight, Marine, Mine.....See M
Car Trailer Connection.....See C
Extension .....See E

A. B. C. See Anderson Mfg. Co.
Adam Electric Co., Frank, St. Louis, Mo. F . . . . . .
Adapti Co., 2996 E. 72nd, Cleveland, O. F . . . . . .
Anderson Mfg. Co., Albert & J. M., 289 A, Boston, Mass. . . . . B W M C E
Appleton Elec. Co., 1703 Wellington Ave., Chicago, Ill. . . . . M . . .
Arktite. See Crouse-Hinds Co.
Armaseal Electric Co., 13 Water, New York . . . . . M . . .
Arrow Electric Div. of Arrow-Hart & Hegeman Elec. Co., Hartford, Conn.. F B W . . . . .
Auth Electrical Specialty Co., 422 E. 53rd, New York, N. Y. . . . . E
Benjamin Elec. Mfg. Co., Des Plaines, Ill. F . . W M . . .
Bryant Elec. Co., Bridgeport, Conn. (Also Range Type.) . . . . . W . . . .
Campbell. See Steel City Elec. Co.
Cannon Elec. Development Co., 420 West Ave., 33, Los Angeles, Cal. . . . . F . . . . . .
C. E. M. Co. See Conn. Elec. Mfg. Co.
C. H. See Cutler-Hammer Mfg. Co.
Circle F Mfg. Co., Trenton, N. J. . . . . M . . .
Conduletto. See Crouse-Hinds Co.
Connecticut Elec. Mfg. Co., Bridgeport, Conn. . . . . F . . . . . .
Cory & Son, Chas., 183 Varick, New York . . . . . M . . . .
Crouse-Hinds Co., Syracuse, N. Y. . . . . B W . . . . .
Cutler-Hammer, Inc., 1288 St. Paul Ave., Milwaukee, Wis. . . . . F . . . . . .
Electric Service Supplies Co., 17th & Cambria Sts., Philadelphia, Pa. . . . . C . .
Elwell Parker Elec. Co., 4222 St. Clair Ave., N. E., Cleveland, O. . . . . B . . . . . .
Fielding. See Stanley & Patterson.
Fountain's. See Jenkins Mfg. Co.
Fullman Mfg. Co., Latrobe, Pa. . . . . F . . . . . .
Fullman. See Steel City Elec. Co.
General Elec. Co., Merchandise Dept., Bridgeport, Conn. . . . . B . . . . . .
Gleason & Co., J. L., 241 Franklin, Boston, Mass. . . . . E
H. & H. See Hart & Hegeman, Div. of Arrow-Hart & Hegeman Elec. Co.
Hart & Hegeman, Div. of Arrow-Hart & Hegeman Elec. Co., Hartford, Conn. . . B W . . . . .
Hessel Co., W. F., 76 Greenwich, New York, N. Y. . . . . W M . . E
Hubbell, Inc., Harvey, Bridgeport, Conn. (Range Type.) . . . . . B W . . . . .
Indestructible. See Kliegl Bros. Universal.
Jenkins Mfg. Co., Bloomfield, N. J. . . . . E
Kliegl Bros. Universal Elec. Stage Lighting Co., 321 W. 50th, New York, N. Y. F B W M . . . .
Latrobe. See Fullman Mfg. Co.
Lexington Electric Products Co., 12 Chapel, Newark, N. J. . . . . .
Loeffelnoiz & Co., Milwaukee, Wis. . . . . C . .
Major Equipment Co., 4603 Fullerton Ave., Chicago, Ill. . . . . M . . .
Neco. See Novelty Elec. Co.
NePage McKenny Co., Seven Front, Seattle, Wash. . . . . F . . . . . .
Novelty Elec. Co., Tenth & Cherry Sts., Philadelphia, Pa. . . . . C . .
Ohio Elec. & Controller Co., 5903 Maurice Ave., Cleveland, Ohio. . . . . W . . . . .
Ostrander Elecl. Works, W. B., 911 Atlantic Ave., Brooklyn, N. Y.
Preset. See Walker Bros. Co.
Pyle National Co., 1334 N. Kostner Ave., Chicago, Ill. . . . . W M C E
Quadrangle Mfg. Co., 32 S. Peoria, Chicago, Ill. (Combination wall bracket and convenience outlet.) . . . . . .
Raleo Mfg. Co., 123 N. Albany Ave., Chicago, Ill. . . . . .
Russell & Stoll Co., 53 Rose, New York F B W M . . E
Square D. Co., Detroit, Mich. . . . . W . . . . .
Stanley & Patterson, 150 Varick, New York, N. Y. . . . . F . . . . . .
Steel City Elec. Co., Pittsburgh, Pa.. F . . . . . E
Thomas & Betts Co., 15 Park Place, New York, N. Y. . . . . F . . . . . .
V. V. Fittings Co., 711 Cherry, Philadelphia, Pa. . . . . M . . . .
Walker Bros., 12 E. 41st St., New York, N. Y. . . . . F . . . . . E
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa. . . . . F B W M . . .
Yale. See Electric Products Co.

RECORDERS, Elapsed Time. See Indicators, Operation.

REDUCERS, Socket. See Socket Reducers.

REFLECTOR LENSES. See Lenses.

REFLECTORS, Porcelain Enameled, Steel

4-Bolite Reflector Co., 7500 Sherman Ave., Cleveland, O.
Benjamin Elec. Mfg. Co., Des Plaines, Ill.
Cello, Inc., 96 Prince, New York, N. Y.
Dunlap Co., John, Carnegie, Pa.
Durex. See Wheeler Reflector Co.
Federal Electric Co., 8700 S. State, Chicago, Ill.
Goodlites. See Goodrich Elec. Co.
Goodrich Elec. Co., 1650 Ogden Ave., Chicago, Ill.
Isolux. See Wheeler Reflector Co.
Ivanhoe Division of Miller Co., Cleveland.
Jumbo. See Quadrangle Mfg. Co.
Marbelite Art Products Co., 140 N. Robey, Chicago, Ill.
Monk, H. E., 18 Warren, New York, N. Y.
Multi Elecl. Mfg. Co., 210 N. Ogden Ave., Chicago, Ill.
Oamed. See Overbaugh & Ayers.
Overbaugh & Ayers, 411 S. Clinton, Chicago, Ill.
Para Steel. See Wheeler Reflector Co.
Perfection. See Tindall & White.
Philadelphia Elec'l & Mfg. Co., 1228 N. 31st, Philadelphia.
Quad. See Quadrangle Mfg. Co.
Quadrangle Mfg. Co., 32 S. Peoria, Chicago, Ill.
Richardson Reflector Co., 16 Hudson, New York, N. Y.
Sturdox. See Benjamin Elec. Mfg. Co.
Tindall & White, 33 W. 60th, New York, N. Y.

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Brawley Felt Feet are furnished with machine or wood screws and nails. Look for the name stamped on every piece.

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We have manufactured and supplied glassine paper for insulating to the Electrical Trade for 25 years.

Made in various thicknesses
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Sheets and perfect rolls
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REFLECTORS, Porcelain Enameled, Steel—Continued
Vaporlux. See Wheeler Reflector Co.
Westinghouse Elec. & Mfg. Co., South Bend, Ind.
Wheeler Reflector Co., 275 Congress, Boston, Mass.
REFRIGERANTS. See Chemicals, Refrigeration.
REFRIGERATION CHEMICALS. See Chemicals, Refrigeration.

REFRIGERATOR CABINETS

Airlite. See Rhinelander Refrigerator Co.
Alaska Refrigerator Co., Muskegon, Mich.
American Refrigerator Corp., Peru, Ind.
Arlington Refrigerator Co., Arlington, Vt.
Athermos. See Gurney Refrigerator Co.
Baldwin Refrigerator Co., Burlington, Vt.
Banta Refrigerator Co., Clearfield, Pa.
Belding-Hall Electrice Corp., Belding, Mich.
Benjamin Elec. Mfg. Co., Des Plaines, Ill.
Bohn Refrigerator Co., St. Paul, Minn.
Cavalier. See Tennessee Furniture Co.
Challenge Refrigerator Co., Grand Haven, Mich.
Champion Refrigerator Co., 206 Lexington Ave., New York.
Crystal Refrigerator Co., Fremont, Neb.
Crysteel. See Benjamin Elec. Mfg. Co.
Dry-Air. See Baldwin Refrigerator Co.
Dry-Cold. See Hill & Co.
Eddy & Sons Co., D., 336 Adams, Boston, Mass.
Erie Art Metal Co. & Erie Metal Furniture Co., Erie, Pa.
General Necessities Corp., General Necessities Bldg., Detroit, Mich.
Gibson Refrigerator Co., Greenville, Mich.
Gloekler Co., Bernard, 1627 Penn Ave., Pittsburgh, Pa.
Gurney Refrigerator Co., Fond du Lac, Wis.
Harder Refrigerator Corp., Cobleskill, N. Y.
Haskelite Mfg. Co., 120 S. La Salle, Chicago, Ill (Knockdown.)
Heintz Mfg. Co., Front & Olney Aves., Philadelphia, Pa.
Heinz & Munschauer, Superior and Randall, Buffalo, N. Y.
Herrick Refrigerator Co., 1805 River, Waterloo, Iowa.
Hibbard Cabinets, Inc., 6504 Euclid Ave., Cleveland, O.
Hill & Co., C. V., 360 Pennington Ave., Trenton, N. J.
Holderle Bros., Inc., 339 Exchange, Rochester, N. Y.
Howe Scale Co., Rutland, Vt.
Jewett Refrigerator Co., Buffalo, N. Y.
Kingston. See Lorillard Refrigerator Co.
Kleen Kold. See Harder Refrigerator Corp.
Knox Products Co., Fourth & Greenhill Ave., Wilmington, Del.
Knox. See Erie Art Metal Co.
Leonard Refrigerator Co., Div. of Kelvinator Corp., Grand Rapids, Mich.
Liver & Co., C. B., Omaha, Neb.
Loeber Co., Henry G., 151 E. 126th, New York, N. Y (Ice Cream Cabinet.)
Lorillard Refrigerator Co., 44 Cooper Square, New York.
Louisville Refrigerator Corp., 4460 Louisville Ave., Louisville, Ky.
Louisville Tin & Stove Co., Louisville, Ky.
Mace & Co., L. H., 55 E. 150th, New York, N. Y.
Maine Mfg. Co., Nashua, N. H.
McCray Refrigerator Sales Corp., 2864 Lake St., Kendallville, Ind.
Mowatt Refrigerator Co., 25 Oak Grove, San Francisco, Cal.
Omaha Fixture & Supply Co., 11th and Douglas, Omaha.
Oreole. See Ottenheimer Bros.
Ottenheimer Bros., Baltimore, Md.
Plymetl. See Haskelite Mfg. Co.
Reol. See Ottenheimer Bros.
Reolite. See Ottenheimer Bros.
Rex Mfg. Co., Connersville, Ind.
Rexdale. See Rex Mfg. Co.
Rhinelander Refrigerator Co., Rhinelander, Wis.
Sanitary Refrigerator Co., Fond du Lac, Wis.
Schmidt Co., C., John and Livingston, Cincinnati, O
Seeger Refrigerator Co., St. Paul, Minn.
Sherer-Gillett Co., 601 W. Washington, Chicago, Ill.
Steeprest. See Heintz Mfg. Co.
Success Mfg. Co., Gloucester, Mass.
Tennessee Furniture Co., Chattanooga, Tenn.
Vogt. See General Necessities Corp.
Ward Refrigerator Co., 6901 S. Alameda, Los Angeles, Cal
White Mountain. See Maine Mfg. Co.
White Seal. See Louisville Refrigerator Co.

REFRIGERATOR CONDENSER UNITS. See Condenser Units, Refrigerator.

REFRIGERATOR FITTINGS

Commonwealth Brass Corp., 5781 Commonwealth Ave., Detroit, Mich.

REGULATORS, Temperature

American Radiator Co., 1807 Elmwood Ave., Buffalo, N. Y. (Mercury Switch Type.)
American Telethermometer Co., 1017 Summit, Toledo, O.
American Thermostat Co., 226 Jelliff Ave., Newark, N. J.
Automatic Electric Heater Co., 1706 Race, Philadelphia, Pa. (Furnace.)
Automatic Reclosing Circuit Breaker Co., Columbus, O.
Basel Mfg. Co., 911 Mulberry, Kansas City, Mo.
Boston Machine Wks. Co., 7 Willow, Lynn, Mass.
Brown. See Electric Automatic Appliance Co.
Brown Instrument Co., Wayne & Windrim, Philadelphia.
Ceaco. See Cobb Electric Appliance Co.
Cobb Electric Appliance Co., 100 Massachusetts Ave., Boston.
Cook Elec. Co., 2700 Southport Ave., Chicago, Ill.
Davis & Daggett Co., 238 Dwight, Springfield, Mass.
D. & T. Manufacturing Co., 3001 La Salle, St. Louis, Mo.
Electric Automatic Appliance Co., Denver, Col.
Engelhart, Chas., 90 Chestnut, Newark, N. J.
Fabrice Thermostatic Control Co., 4750 Sheridan Rd., Chicago, Ill.
Gifford Heat Control Systems, 1 Broadway, New York.
Gold Car Htg. & Ltg. Co., 220 36th, Brooklyn, N. Y.
Hart Mfg. Co., Hartford, Conn.
Hermansen Elecl. Co., 505 W. 41st, New York, N. Y.
Hynes & Cox Elec. Corp., 406 N. Pearl, Albany, N. Y.
Jewell Mfg. Co., Auburn, N. Y.
Johnson Service Co., 149 Michigan, Milwaukee, Wis.
Lockswitch. See Time-O-Stat Controls Co.
Majestic Electric Appliance Co., San Francisco, Cal.
Marvel. See American Thermostat Co.
Mercoid Corp., 564 W. Adams, Chicago, Ill. (Mercury Switch.)
Minneapolis-Honeywell Regulator Co., 2753 Fourth Ave., Minneapolis, Minn.
Penn Electric Switch Co., Des Moines, Iowa.
Penn Heat Control Corp., 1207 Race, Philadelphia, Pa.
Powers Regulator Co., 2720 Greenview Ave., Chicago, Ill.

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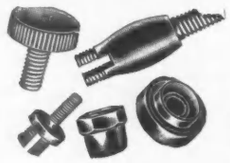
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WORCESTER, MASS.

Protectostat. See Minneapolis-Honeywell Regulator Co.
Quick Freeze. See Penn Electric Switch Co.
Ranco. See Automatic Reclosing Circuit Breaker Co.
Savaline Devices, Inc., 88 Manhattan, Rochester, N. Y.
Simplex Heat Regulator, 2938 Pillsbury Ave., Minneapolis.
Snapon. See Tagliabue Mfg. Co.
Souder-Chrisny Co., Tamaqua, Pa.
Sure Acting. See Boston Machine Wks.
Tagliabue Mfg. Co., C. J., 18 33rd, Brooklyn, N. Y.
Time-O-Stat Controls Co., Cramblet Engineering Div., 286 Milwaukee Ave., Milwaukee, Wis.
Trent Co., Harold E., 439 N. 12th, Philadelphia, Pa.
Webster Elec. Co., Racine, Wis.
White Mfg. Co., 2362 University Ave., St. Paul, Minn.
Wilcolator Co., Newark, N. J.
Wilson-Maeulin Co., 383 Concord Ave., New York, N. Y

REGULATORS, Voltage

Ward-Leonard Electric Co., Mount Vernon, N. Y.
Rotor. See Ward-Leonard Electric Co.

RELAYS

(See also Circuit Breakers and Thermostats.)
American Instrument Co., 774 Girard, N. W., Washington, D. C.
Automatic Switch Co., 154 Grand, New York, N. Y.
Benjamin Elec. Mfg. Co., Des Plaines, Ill.
Burke Controller Co., 369 Lexington Ave., New York, N. Y.
Dunco. See Struthers Dunn, Inc.
General Electric Co., Schenectady, N. Y.
Leach Relay Co., 693 Mission, San Francisco, Cal.
Roller-Smith Co., 239 Broadway, New York, N. Y.
Signal Engineering & Mfg. Co., 146 W. 14th, New York
Struthers Dunn, Inc., 1135 Race, Philadelphia, Pa.
Wilcolator Co., Newark, N. J.
REMOTE CONTROL SWITCHES. See Switches, Remote Control.

REMOVERS, Coil

Ewing Mfg. Company, Middleport, Ohio.

RESISTANCE

Boxes. See Instruments, Laboratory Standard
Coil Cores. See Cores, Resistance.
Test Sets. See Instruments.
Units, Radio. See Radio Circuit Components.
Units. See Units, Rods & Grids.
Wire. See Wire Bare.

RESISTORS

Lautz Mfg. Co., 345 N. J. R.R. Ave., Newark, N. J.
Ohmite Mfg. Co., 636 N. Albany Ave., Chicago, Ill.
RESISTORS. See Units, Rods & Grids.
RESURFACERS, Commutator. See Stones, Commutator, also Tools, Commutator Truing.
REVOLUTION COUNTERS. See Tachometers.
RHEOSTATS,
Motor-Controlling. See Controllers, also Rheostats
Radio. See Radio Receiver Parts.
Sewing Machine. See Controllers.

RHEOSTATS

	KEY
Battery Charging	See B
Stage Dimming	See D
Meter Testing (Laboratory)	See L
Plating Tank	See P
Motion Pictures (Projector Lamp)	See M
Motor Starting, Field and Speed Regulating	See F

	F	B	D	P	M	L
Allen-Bradley Co., 494 Reed, Milwaukee						L
Biddle, James G., 1211 Arch, Philadelphia						L
Brach Mfg. Corp., L. S., Newark, N. J. (Radio Battery Control.)		B				
Bradleystat. See Allen-Bradley Co.						
Columbia Electric Mfg. Co., 1292 E. 52nd, Cleveland, O.				P		
Controlite. See Ward Leonard Elec. Co.						
Crown Rheostat & Supply Co., 1908 Maypole Ave., West Chicago, Ill.				P		
Cutler-Hammer, Inc., 1288 St. Paul Ave., Milwaukee, Wis.	F	B	D			L
Economic Rheostat Switch Co., 3351 N. 5th, Philadelphia, Pa.	F					
Electric Controller & Mfg. Co., 2700 E. 79th, Cleveland, O.	F					
Electric Products Co., 1725 Clarkstone Rd., Cleveland, O.		B				
General Electric Co., Schenectady, N. Y.	F					L
Hanson-Van Winkle-Munning Co., Matawan, N. J.				P		
Holzmuller, C. J., 1108 Howard, San Francisco, Cal.				D		
Kliegl Bros. Universal Elec. Stage Lighting Co., 321 W. 50th, New York, N. Y.			D		M	
Knoeller Elec. Co., De Pere, Wis.	F					
National Elec. Controller Co., 5315 Ravenswood Ave., Chicago	F	B	D		M	L
Optimus. See Hanson-Van Winkle-Munning Co.						
Robertson, Leo F., Inc., 532 W. 22nd, New York, N. Y.					M	
Rubicon Co., 29 W. Sixth, Philadelphia, Pa.						L
Schaefer Bros. Co., 1059 W. 11th, Chicago		B				
Simplicity. See Cutler-Hammer Mfg. Co.						
Union Elec. Mfg. Co., 934 Juneau Ave., Milwaukee, Wis.	F					
Universal. See Ward Leonard Elec. Co.						
Vitrohm. See Ward Leonard Elec. Co.						
Ward Leonard Elec. Co., 31 South, Mt. Vernon, N. Y.	F		D		M	
Watton. See Electric Products Co.						
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.	F				M	

RINGS Seal. See Packing.

RIVETS

American Brass Co., Waterbury, Conn.

Blake & Johnson Co., 1497 Thomaston Ave., Waterville, Conn.
Chase Brass & Copper Co., Waterbury, Conn.
Chicago Rivet & Specialty Co., 1839 S. 54th, Chicago, Ill.
Hassall, Inc., John, 402 Oakland, Brooklyn, N. Y.
Hungerford Brass & Copper Co., Div. of The Chase Brass Companies, Inc., 88 Lafayette, New York, N. Y.
Manufacturers Belt Hook Co., 1315 W. Congress, Chicago, Ill.
Nelson Rivet Co., Taunton, Mass.
Stimpson Co., Edwin B., 70 Franklin Ave., Brooklyn, N. Y.
Thomson Mfg. Co., Judson L., Waltham, Mass.
Tubular Rivet & Stud Co., 87 Lincoln, Boston, Mass.
Waterbury Brass Goods Co., Waterbury, Conn.
Wright & Corson Mfg. Co., Bridgeport, Conn.
RODS, Resistance. See Units, Rods and Grids.
ROLLER BEARINGS. See Bearings, Ball and Roller.

ROLLS, Coil Flattening

Columbia Machine Tool Works & Malleable Iron Co., Atlantic Ave. and Chestnut St., Brooklyn, N. Y.
RUBBER BELTS. See Belts, Rubber.

RUBBER, Hard

Hard Rubber, Ebonite, Vulcanite.
Aetna Rubber Co., 815 E. 79th, Cleveland, O.
American Hard Rubber Co., 11 Mercer, New York, N. Y.
Connecticut Hard Rubber Co., West Haven, Conn.
Goodrich Rubber Co., B. F., Akron, O.
Luzerne Rubber Co., Muirhead, near Dewey, Trenton, N. J.
Mahoganite. See American Hard Rubber Co.
New York Hard Rubber Turning Co., 212 Centre, New York.
Panelyte Corp., Trenton, N. J.
Radiolite. See Superior Hard Rubber Co.
Stokes Rubber Co., Trenton, N. J.
Superior Hard Rubber Co., Butler, N. J.
United States Rubber Co., 1790 Broadway, New York, N. Y.
Vulcanized Rubber Co., 251 4th Ave. New York, N. Y.
Vulco Panels. See Vulcanized Rubber Co.

RUBBER, MECHANICAL GOODS

Goodrich Rubber Co., B. F., Akron, O.
Manhattan Rubber Mfg. Co., Passaic, N. J.
Republic Rubber Co., Youngstown, O.
Sun Rubber Co., Barberton, O.
Toycraft Rubber Co., Dept. W., Ashland, O.
RUBBER, SEMI-HARD. See Rubber Mechanical Goods.

RUBBER, Sponge

Sun Rubber Co., Barberton, O.
Toycraft Rubber Co., Dept. W., Ashland, O.
RUBBER TAPE. See Tape, Rubber and Friction.
RUBBER TUBING. See Tubing, Rubber.
RUST PROOFING. See Plating & Finishing.
SAL AMMONIAC. See Chemicals, Battery.
SALTS, Battery. See Chemicals, Battery.
SATURATING TANKS. See Wire Manufacturing Machines
SCREW SHELLS, Socket. See Shells, Screw Socket.

SCREW DRIVING MACHINES

Vim Electric Tool Co., 149 Broadway, New York, N. Y.

SCREW MACHINE PRODUCTS

Aluminum Co. of America, 2444 Oliver Bldg., Pittsburgh, Pa.
American Metal Wks., 4865 Stanton Ave., Philadelphia, Pa.
Barnes Co., Wallace, Bristol, Conn.
Blake & Johnson Co., 1497 Thomaston Ave., Waterville, Conn.
Bridgeport Brass Co., 774 E. Main, Bridgeport, Conn.
Brighton Screw & Mfg. Co., 1456 Harrison Ave., Cincinnati, O.
Chapman Machine Co., Terryville, Conn.
Chase Brass & Copper Co., Waterbury, Conn.
Colonial-Premier Co., 225 W. Ohio, Chicago, Ill.
Continental-Diamond Fibre Co., Bridgeport, Pa.
Eureka Tool & Machine Co., Newark, N. J.
Faries Mfg. Co., Decatur, Ill.
Hanson, Elnar R., 17 Hermon, Worcester, Mass.
Hubbell, Inc., Harvey, Bridgeport, Conn.
Indianapolis Screw Products Co., 621 N. Noble, Indianapolis.
Interstate Products Corp., 29 Commercial, Newark, N. J.
Linden & Co., 891 Broad, Providence, R. I.
Meisel Press Mfg. Co., 944 Dorchester Ave., Boston, Mass.
Olsen Mfg. Co., 56 Commercial, Worcester, Mass.
Pheoll Mfg. Co., 5700 Roosevelt Rd., Chicago, Ill.
Plume & Atwood Mfg. Co., 474 Bank, Waterbury, Conn.
Progressive Mfg. Co., Torrington, Conn.
Scovill Mfg. Co., Waterbury, Conn.
Shimer & Sons, Samuel J., Milton, Pa.
Steiner & Co., 297 Washington, Newark, N. J.
Thomaston Mfg. Co., Thomaston, Conn.
Waterbury Brass Goods Corp., Waterbury, Conn.
Wilmington Fibre Specialty Co., Wilmington, Del.

SCREWS, Cap (Cut Thread)

Bristol Co., Waterbury, Conn.
Hartford Machine Screw Co., Hartford, Conn.

SCREWS, Drive

Parker-Kalon Corp., 190 Varick, New York, N. Y.

SCREWS, Machine

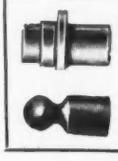
Blake & Johnson Co., 1497 Thomaston Ave., Waterville, Conn.
Chicago Nut Mfg. Co., 2513 Cullerton, Chicago, Ill.
Clark Metal Products, Inc., 490 Hancock Ave., Bridgeport, Conn.
Elco Tool & Screw Corp., Rockford, Ill.
Hubbell, Inc., Harvey, Bridgeport, Conn.
New England Screw Co., Dept. A, 44 Farnsworth, Boston.
Pheoll Mfg. Co., 5700 Roosevelt Rd., Chicago, Ill.
Progressive Mfg. Co., Torrington, Conn.
Scovill Mfg. Co., Waterbury, Conn.
Strong, Carlisle & Hammond, 1392 W. Third, Cleveland, O.

SCREWS, Machine (Cut Thread)

American Screw Co., Providence, R. I.
SECOHMMETERS. See Instruments, Laboratory Standard.
SEGMENTS. See Discs, Armature.

SEPARATORS, Storage Battery

Baltimore Battery Separator Co., Baltimore, Md.
Campbell Elec. Co., Kansas City, Mo.
Carlile & Doughty, 2530 N. Broad, Philadelphia, Pa.
Chattanooga Battery Box Co., Chattanooga, Tenn.
Certified. See Ermet Products Co.
Ermet Products Co., Sherman Drive & 16th, Indianapolis, Ind. (Wood.)
Estes & Sons, E. B., 25 Vanderbilt Ave., New York. (Wood.)
Indianapolis Box & Separator Co., 1450 E. 19th St., Indianapolis, Ind. (Wood.)
Indianapolis Mfg. Co., Indianapolis, Ind.
Inseco. See Indianapolis Box & Separator Co.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in Brass or Steel
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THE STANDARD MICA INSULATION
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PORCELAIN COMPANY
TRENTON NEW JERSEY

SEPARATORS, Storage Battery—Continued
Link & Hemrick, Inc., 555 W. 52nd, New York, N. Y.
Red Band. See Indianapolis Mfg. Co.
Stewart Mfg. Co., Wm. E., 14th & Elm, Flint, Mich. (Wood.)
Wick Lumber Co., R., 539 W. 52nd, New York. (Wood.)

SHADES
Aluminum. See Shades, Metallic.
Asbestos. See Shades, Fabric.
Bamboo. See Shades, Fabric.
Brass. See Shades, Metallic.
Cast Metal. See Shades and Domes.
Copper. See Shades Metallic.
Cretonne. See Shades, Fabric.
Leaded. See Shades and Domes.
Leather. See Shades, Fabric.
Linen. See Shades, Fabric.
Mica. See Shades, Mica.
Molded. See Molded Insulation.
Mosaic. See Shades and Domes.
Paper. See Shades, Fabric.
Parchment. See Shades, Fabric.
Silk. See Shades, Fabric.
Stamped Metal. See Shades, Metallic; also Shades and Domes.
Steel. See Shades, Metallic.
Tin. See Shades, Metallic.
Zinc. See Shades, Metallic.

SHADES, Fabric
Asbestos Cretonne, Leather, Linen, Paper, Silk, Bamboo Parchment.
Acme Lamp Shade Co., 630 West Jackson Blvd., Chicago. (Silk.)
Adelphi Lamp Shade Co., 242 Fifth Ave., New York. (Silk.)
Admiration Lamp Shade Co., 160 Madison Ave., New York, N. Y. (Silk.)
Andrews Co., C. M., 32 E. 30th, New York, N. Y. (Silk.)
Art Lamp Shade Studios, 316 Fifth Ave., New York, N. Y.
Audrey Art Shade Studios, 105 Thatford Ave., Brooklyn.
Block & Co., L. D., 37 E. 18th St., New York, N. Y.
Borghese. See Hall, Chas.
Dalger Co., Charles V., 76 Essex, Boston, Mass. (Silk.)
Eastern Art Shop, 14 W. 19th, New York. (Parchment.)
Foss Parchment Shade Studio, 1338 E. 12th, Oakland, Cal. (Parchment.)
Foslite. See Foss Parchment Shade Studio.
Frostelene. See Art Lamp Shade Studios.
Gibson Art Co., 223 W. Fourth, Cincinnati, Ohio. (Paper.)
Hall, Chas., 3 E. 40th, New York, N. Y. (Paper Parchment.)
Hanson Co., Paul, 15 E. 26th, New York, N. Y. (Chintz.)
Harris Mfg. Co., 122 University Place, New York, N. Y. (Parchment.)
Herco Art Mfg. Co., Meriden, Conn.
Hoft Studio, 46 W. 21st, New York, N. Y. (Parchment.)
Idealite Elec. Lamp Shade Mfg. Co., 7 E. 17th, New York, N. Y. (Parchment.)
Kapa Shell. See Wardwell, E. H.
Kerwin. See Hall, Chas.
Kno-Glair. See Hamilton, M. E.
Lamb Bros. & Greene Corp., Napannee, Ind. (Silk.)
Luxrite. See John H. St. John.
Maxwell-Ray Co., Milwaukee, Wis. (Silk.)
Monarch Lamp & Shade Co., 210 N. Second, Philadelphia, Pa. (Silk.)
Morimura Bros., 58 W. 23rd, New York. (Bamboo, Silk, Cretonne.)
Parchment Novelty Co., 87 E. 10th, New York, N. Y. (Parchment.)
Patent Lamp Shade Co., 1361 Frankford Ave., Philadelphia.
Peerless Lamp Shade Mfg. Co., 114 E. 25th, N. Y. (Silk.)
R. D. Electric Co., Fort Wayne, Ind. (Linen and Silk.)
Reuter, Wm., 32 W. 34th, New York, N. Y. (Silk.)
Rindsberger Mfg. Corp., 18 E. 24th, Chicago, Ill.
Rosita Studio, 10 W. 28th, New York, N. Y. (Parchment and Leatherette.)
Sanderson's Art Co., Milwaukee, Wis. (Parchment.)
Springel & Son, A., 26 S. 3rd, Philadelphia, Pa.
St. John, John H., 1298 Atlantic Ave., Brooklyn, N. Y. (Silk.)
Straus-Hohenstein Co., 133 W. 21st, New York. (Silk.)
Superior Lamp Shade Manufacturers, 72 Madison Ave., New York, N. Y. (Silk.)
Tombs Studios, Wm. H., 172 Pennsylvania Ave., Newark, N. J. (Parchment Paper.)
Trio Mfg. Co., 610 N. American, Philadelphia, Pa. (Silk.)
Troy Art Studio, 624 2d Ave., Troy, N. Y.
Utility Shade Co., Tenafly, N. J.
Vogue Lamp & Shade Co., 130 W. 17th, New York, N. Y. (Parchment.)
Volkman & Co., 3223 W. Lake, Chicago, Ill.
Wardwell, E. H., 11 E. 36th, New York, N. Y.

SHADES AND DOMES
Leaded, Mosaic or Figured, Stamped or Cast Metal.
Art Shade Co., 224 N. Desplaines, Chicago, Ill.
Badanes Mfg. Co., 62 Greene, New York, N. Y.
Bayley & Sons, 105 Vanderveer, Brooklyn, N. Y.
Mutual Sunset Lamp Co., 21 E. Houston, New York, N. Y.
Western Art Glass Shade Works, 101 Turk, San Francisco.

SHADES, FACTORY WINDOW. See Window Shades, Factory.

SHADES, Metallic
Tin, Aluminum, Brass, Copper, Zinc, Steel.
A. A. Elec. Mfg. Co., Bridgeport, Conn. (Sole selling agent, Harry Pickhardt, 129 W. 15th, New York, N. Y.)
Durex. See Wheeler Reflector Co.
Faries Mfg. Co., Decatur, Ill. (Brass, Aluminum, Tin, Copper.)
Frink Co., Inc., 369 Lexington Ave., New York, N. Y. (Aluminum, Brass, Zinc, Iron, Steel.)
Hubbell, Inc., Harvey, Bridgeport, Conn. (Aluminum, Brass, Steel, Tin.)
Miller Co., Meriden, Conn.
Monk, H. E., 18 Warren, New York, N. Y. (Tin, Aluminum, Brass, Copper, Zinc & Steel).
Oameo. See Overbaugh & Ayres Mfg. Co.
Overbaugh & Ayres Mfg. Co., 411 S. Clinton, Chicago, Ill.
Richardson Reflector Co., 16 Hudson, New York, N. Y.
Western Reflector Co., 1221 W. Madison, Chicago. (Tin.)
Wheeler Reflector Co., 275 Congress, Boston, Mass.

SHADES, Mica
Hirsch Mica Co., 1087 Flushing Ave., Brooklyn, N. Y.
Huse-Liberty Mica Co., 73 Long Wharf, Boston, Mass.
Kant-Krack. See Huse Liberty Mica Co.
Mica Insulator Co., 200 Varick, New York, N. Y.
Storrs Mica Co., 11 Park Place, New York, N. Y.
Tar Heel Mica Co., Plumtree, N. C.
Tarmilite. See Tar Heel Mica Co.

Fair Haven Marble & Marbleized Slate Co.
SLATE GOODS
Fair Haven Vermont

PORTLAND-MONSON SLATE CO.
PORTLAND-MONSON SLATE CO. TRADE MARK PORTLAND, ME.
Quarriers of
Monson Slate
for Electrical
Purposes, Natural
Black, Oil Finish
Quarries:
Monson, Maine
Office, Portland, Maine

SHAFT COUPLINGS. See Couplings, Shaft.
SHAFTS, Flexible. See Tubing, Flexible Metallic.

SHEARS, Insulation
Electric Service Supplies Co., 17th & Cambria Sts., Philadelphia, Pa.

SHEET STEEL CABINETS. See Cabinets, Sheet Steel.

SHELLS, Screw Socket
Chase Brass & Copper Co., Waterbury, Conn.
Dallas Brass & Copper Co., 820 Orleans, Chicago, Ill.
Patton-MacGuyer Co., Providence, R. I.
Risdon Mfg. Co., Naugatuck, Conn.
Scovill Mfg. Co., Waterbury, Conn.
Torrington Mfg. Co., 70 Franklin, Torrington, Conn.
Waterbury Brass Goods Corp., Waterbury, Conn.
Waterbury Button & Moulding Co., Waterbury, Conn. (Miniature.)

SHUNTS, Instruments. See Instruments, Laboratory Standard.
SIGN FLASHERS. See Flashers, Sign.
SIGN LETTER LENSES. See Lenses.

SILICA
Ottawa Silica Co., Ottawa, Ill. "Flint Shot."

SILK, Cloth Insulated. See Cloth & Paper.
Shades. See Shades, Fabric.
Tape. See Tape.
Thread. See Yarn, etc.

SILVER, Metal and Wire
Baker & Co., Inc., 54 Austin, Newark, N. J.
Gilby Wire Co., Riverside Ave., Newark, N. J.
Handy & Harman, 57 William, New York, N. Y.
Wilco. See Wilson Co., H. A.
Wilson Co., H. A., 97 Chestnut, Newark, N. J.

SILVER SOLDER. See Solder, Silver.
SINE WAVE OSCILLATORS. See Instruments, Laboratory Standard.
SIGN ELECTRODES, Gas. See Electrodes for Gas Signs.
SKINNERS WIRE. See Scrapers.
SLABS, Switchboard. See Asbestos Slabs; also Molded Insulation, Slate; Soapstone.

SLATE
For Switchboard Slabs and Barriers.
Davis Slate & Mfg. Co., 618 E. 40th, Chicago, Ill.
Electrical Specialties Corp., 50 Pearl, Boston, Mass.
Fair Haven Marble & Marbleized Slate Co., Fair Haven, Vt.
Penrhyn Slate Co., Hydeville, Vt.
Portland-Monson Slate Co., Portland, Me.
Structural Slate Co., Pen Argyl, Pa.

SLEEVE-BEARINGS. See Bearings and Bushings
SLEEVING, Cotton. See Tape, Cotton.
SLOTTING FILES. See Files, Commutator Slotting.

SLOTTING MACHINES and TOOLS, Commutator
(Mica Undercutters).
Allen Electric & Equipment Co., Kalamazoo, Michigan
Binghamton Flexible Shaft Co., Binghamton, N. Y.
Burton & Rogers Co., 857 Boylston, Boston, Mass.
Electric Service Supplies Co., 17th & Cambria Sts., Philadelphia, Pa.
General Electric Co., Schenectady, N. Y.
Hobart Bros. Co., Troy, Ohio.
Hulbhorst Micro Tool Co., 3240 E. Monroe, Toledo, O
Ideal Commutator Dresser Co., 1039 Park Ave., Sycamore, Ill.
Imperial. See Martindale Elec. Co.
Martindale Electric Co., 1262 W. Fourth, Cleveland, Ohio.
Onan, David W., 43 Royalstone Ave., Minneapolis, Minn
Peerless. See Electric Service Supplies Co.
Ransom & Randolph Co., Superior & Chestnut, Toledo, Ohio
Simplex. See Weidenhoff, Joseph.
South Bend Lathe Works, 425 E. Madison, South Bend, Ind.
Weidenhoff, Joseph, 4352 Roosevelt Rd., Chicago, Ill
White Dental Mfg. Co., S. S., 152 W. 42nd, New York.

SNAP SWITCHES. See Switches, Snap

SOAPSTONE
For Switchboard Slabs and Barriers.
Alberene Stone Co., 153 W. 23rd, New York, N. Y.
Kirchberger & Co., Inc., 1425 37th, Brooklyn, N. J.
Lin-Stun. See Westinghouse.
Westinghouse Elec & Mfg. Co., East Pittsburgh, Pa

SOCKET LININGS. See Linings, Socket
SOCKET SHELLS. See Shells, Screw Socket.
SOCKETS, Flashing. See Flashers, Sign.

SOCKET Chain Attachments
Chain Links, Chain Adjusters, Acorns, Extensions, Insulated Chain Splicers.
Abbott. See Harvey Hubbell, Inc.
Arrow Electric Div. of Arrow-Hart & Hegeman Elec. Co., Hartford, Conn.
Benjamin Elec. Mfg. Co., Des Plaines, Ill.
Bryant Electric Co., Bridgeport, Conn.
Duplex. See Warner Bros. Co.
Eade, John E., 104 Point, Providence, R. I. Links, Insulators.
Easylite. See Rittenhouse Co., A. E.
Economy. See Harvey Hubbell, Inc.
Flory, Wm. E., 38 W. 32nd, New York, N. Y. (Decorative Pull Chains.)
Gripper. See Wittenberg Bros.
Hart & Hegeman, Div. of Arrow-Hart & Hegeman Elec. Co., Hartford, Conn. (Metal Pull Tassel.)
Hubbell, Inc., Harvey, Bridgeport, Conn. (Links and Acorns. Metal Pull Tassels.)
Paiste. See Hart & Hegeman Mfg. Co.
Pass & Seymour, Inc., Solvay Sta., Syracuse, N. Y. (Pull Chain Tassel.)
P. & S. See Pass & Seymour, Inc.
Rittenhouse Co., A. E., Honeoye Falls, N. Y. (Sole Selling Agent, Hatheway & Co., 16 Hudson, New York, N. Y.)
Rodale Mfg. Co., 200 Hudson, New York, N. Y.
Royal. See Sears, Henry D.
Scovil Mfg. Co., Waterbury, Conn. (Acorn.)

Sears, Henry D., 50 Boylston, Boston, Mass.
Waterbury Brass Goods Co., Waterbury, Conn. (Acorns.)
Weber. See Sears, Henry D.
Wittenberg Bros., 60 Shipman, Newark, N. J. Links, Insu-

SOCKET REDUCERS
Arrow Elec. Div. of Arrow-Hart & Hegeman Elec. Co., Hartford, Conn.
Benjamin Elec. Mfg. Co., Des Plaines, Ill.
Cen-del-lite. See Sears, Henry D.
Eagle Electric Mfg. Co., 79 Hall, New York, N. Y.
Electric Co., 94 Allyn, Hartford, Conn.
General Electric Co., Merchandise Dept., Bridgeport, Conn.
Hart & Hegaman Div. of Arrow-Hart & Hegeman Elec. Co. Hartford, Conn.
Morse Co., Frank W., 291 Congress, Boston, Mass.
Pass & Seymour, Solvay Sta., Syracuse, N. Y.
Propp Co., M., 524 Broadway, New York, N. Y.
Rotaie Mfg. Co., 200 Hudson, New York, N. Y.
Sears, Henry D., 80 Boylston, Boston, Mass.

SOCKETS, Radio. See Radio Receiver Parts.

SOCKETS AND RECEPTACLES, Lamp
Bases other than Standard (or Medium) are indicated as follows: Mogul, M; Candelabra (or Miniature), C.

Key	See K
Composition	See W
Metal Shell	See B
Porcelain	See A
Pull Chain	See P
Push Through	See T
Sign Receptacles	See A

A. B. C. See Leviton Mfg. Co.
Acme Elec. & Mfg. Co., Canal & Hamilton Ave., Trenton, N. J. ..... A
Ajax Elec. Specialty Co., 1926 Chestnut, St. Louis, Mo. ..... W
Alabax. See Arrow Elec. Co.
Alcor Mfg. Co., 4605 W. Madison, Chicago, Ill. C
Appleton Electric Co., 1730 Wellington Ave., Chicago, Ill. ..... A
Armstrong & White, 9th and Liberty Ave., Pittsburgh, Pa. ..... A
Arrow Elec. Div. of Arrow-Hart & Hegeman Elec. Co., Hartford, Conn. M C K T P B A
Arrogrip. See Arrow Elec. Co.
A. & W. See General Outdoor Adv. Co.
Beaver Mfg. Co., 625 N. Third, Newark, N. J. ..... C ..... P B
Best. See United States Elec. Mfg. Corp.
Bryant Elec. Co., Bridgeport ..... M C K T P B A
C-H. See Cutler-Hammer Mfg. Co.
Circle F Mfg. Co., Trenton, N. J. ..... M .. K T P B A
Circle T. See Trumbull Elec. Mfg. Co.
Colt's Patent Fire Arms Mfg. Co., Hartford, Conn. .....
Connecticut Elec. Mfg. Co., Bridgeport, Conn. ..... M .. K T .. B A
Crouse-Hinds Co., Syracuse, N. Y. ... A W .....
Cutler-Hammer, Inc., 1287 St. Paul Ave., Milwaukee, Wis. ..... K T .. B A
Durex. See Wheeler Reflector Co.
Eagle Elec. Mfg. Co., 79 Hall, Brooklyn.
Economy Fuse & Mfg. Co., 2717 Greenview Ave., Chicago, Ill. ..... P B ..
Far-Go Elec. Mfg. Co., 368 Broome, New York, N. Y. ..... C .....
Federal Electric Co., 8700 S. State, Chicago, Ill. ..... A
Flute. See Pass & Seymour.
Flutelier. See Pass & Seymour.
Frink Co., Inc., 369 Lexington Ave., New York, N. Y. ..... M C ..... B ..
Gaynor Elec. Co., Stratford, Conn. ..... A
General Elec. Co., Merchandise Dept., Bridgeport, Conn. ..... M C K T P B A
Hart & Hegeman, Div. of Arrow-Hart & Hegeman Elec. Co., Hartford, Conn. ..... M C K T P B A
Hoosick Falls Radio & Elec'l Parts Mfg. Co., Hoosick Falls, N. Y. ..... W .....
Horan Co., E. S., 550 Monroe, Carlstadt, N. J. ..... A
Hubbell, Inc., Harvey, Bridgeport, Conn. M C K T P B A
H. & H. See Hart & Hegeman.
I-D-A. See Watson Mfg. Co., J. E.
K-E Cleat Receptacle. See Kirkman.
Kirkman Engineering Co., 1 Dominick, New York. (Cleat Receptacle.) .....
Leader. See Leviton Mfg. Co.
Leiser & Co., W. A., 1607 Sansom, Philadelphia, Pa. ..... A
Leviton Mfg. Co., 226 Newell, Brooklyn, N. Y. ..... M C K .. P B A
Levolier. See McGill Mfg. Co.
Liberty Bell. See Hart & Hegeman.
Locat-A-Catch. See Connecticut.
McGill Mfg. Co., Valparaiso, Ind. ..... P B A
Majestic Elec. Mfg. Co., 806 N. 12th, St. Louis. (Lamp Receptacle.) ..... A
Molded Socket Corp., Railroad, Pa. ..... K .....
Multi Elec'l Mfg. Co., 1840 W. 14th, Chicago, Ill. ..... A
Multilok. See Circle F Mfg. Co.
Newgard. See Multi Elec'l Mfg. Co.
New Wrinkle. See Bryant Elec.
Neark. See Colt's Patent Fire Arms.
One 4 All. See Propp Co., M.
P. & S. See Pass & Seymour.
Pass & Seymour, Solvay Station, Syracuse, N. Y. ..... M C K T P B A
Paulding, John I., New Bedford, Mass. ..... B A
Perkins. See Bryant Elec. Co.
Porcelain Products, Inc., Findlay, O. ..... A
Propp Co., M., 524 Broadway, New York, N. Y. .....
Quick Catch. See Hubbell, Inc.
Royal. See Sears, Henry D.
Ryan Appliance Co., 117 Mulberry, Trenton, N. J. ..... W ..... A
Safti Soc. See Molded Socket Corp.
Sears, Henry D., 80 Boylston, Boston M C K T P B A
Security. See Circle F Mfg. Co.
Shurlock. See Pass & Seymour.
Siemen Co., Bridgeport, Conn. .....
Taplet Mfg. Co., 3709 Powelton Ave., Philadelphia, Pa. ..... A
Titan. See Bryant Elec. Co.
Trumbull Elec. Mfg. Co., Plainville, Conn. ..... A

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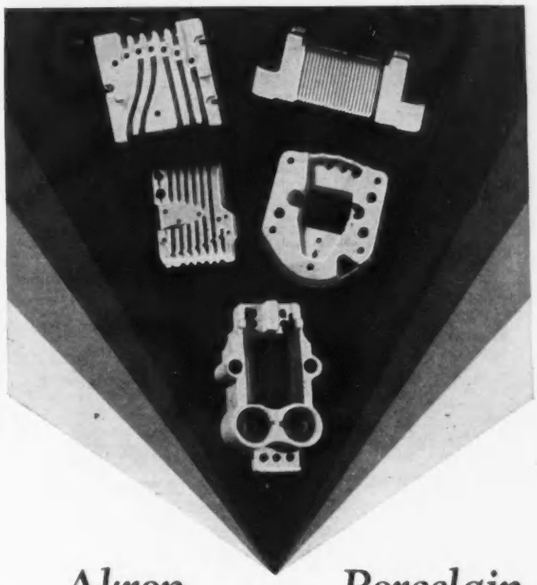

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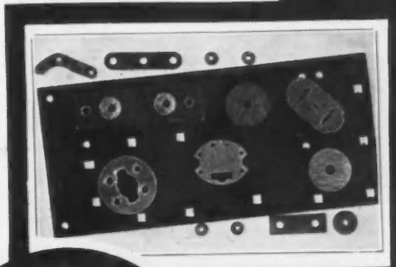

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United States Elec. Mfg. Corp., 222 W. 14th, New York, N. Y. . . . . P . . B . . W
U. S. Electric Co., 311 Chambers St., Trenton, N. J. . . . . A
Walco. See Leiser & Co., W. A.
Waterbury Button & Moulding Co., Waterbury, Conn. . . . . .
Watson Mfg. Co., J. E., 5506 N. Fifth, Philadelphia, Pa. (Concealed Fixture) . . . . . P B . .
Weber. See Sears, Henry D.
Wheeler Reflector Co., 275 Congress St., Boston, Mass. . . . . P . . .
Wood Electric Co., C. D., 565 Broadway, New York. (Sign Receptacles.) . . . . . A
Woodwin. See Wood Elec. Co.
Wrinklet. See Bryant Elec. Co.

SOLDER, Aluminum

Allen Co., Inc., L. B., 6750 Bryn Mawr Ave., Chicago, Ill
Aluminum Solder Corp. of America, 730 Fifth Ave., New York, N. Y.
Lasher-Weeber Co., 261 Franklin, Boston, Mass.
Lenk Mfg. Co., 30 Merrimac, Boston, Mass.
Platt Bros. & Co., Waterbury, Conn.
Solderlume. See Aluminum Solder Corp. of America.
Supreme. See Lasher-Weeber Co.
Union Smelting & Refining Co., Newark, N. J.
Usarco. See Union Smelting & Refining Co.

SOLDER, Bar and Wire

Eagle. See Hoyt Metal Co.
Genuine A. See Hoyt Metal Co.
Hoyt Metal Co., St. Louis, Mo.
National Bearing Metal Corp., Div. More-Jones Brass & Metal Co., 4930 Manchester Ave., St. Louis, Mo.

SOLDER, Self-Fluxing

American Solder & Flux Co., 2910 N. 16th, Philadelphia.
Dutch-Boy. See National Lead Co.
Gardiner Metal Co., 1366 W. Lake, Chicago, Ill.
Kester Solder Co., 4210 Wrightwood Ave., Chicago, Ill.
Lenk Mfg. Co., 32 Merrimac, Boston, Mass.
National Lead Co., 111 Broadway, New York, N. Y.
Silva-Wares, Inc., 134 W. 26th St., New York, N. Y.
Solderall Co., 129 Sussex Ave., Newark, N. J.
Tinol. See American Solder & Flux Co.

SOLDER, Silver

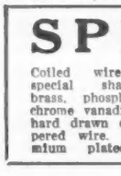
Handy & Harman, 57 William, New York, N. Y.
Wilson Co., H. A., Newark, N. J.

SOLENOIDS. See Coils, Finished.

SOLDERING
Compounds. See Soldering Compounds.
Irons. See Soldering Irons.
Machines. See Soldering Machines, Commutator
Tools. See Torches and Furnaces

SOLDERING COMPOUNDS

Stick Paste, Flux Salts, Fluid.
Allen Co., Inc., L. B., 6750 Bryn Mawr Ave., Chicago, Ill (Soldering, Stick Paste, Salts, Liquid Oil, Welder, Aluminum Flux, Fountain Brushes.)
American Solder & Flux Co., 2910 N. 16th, Philadelphia. Pa Flux, Paste, Salts.
Amco. See American Solder & Flux Co.
Anchor. See Garden City Laboratory.
Benson Co., Alex R., Hudson, N. Y. (Salts and Paste.)
Burnley Battery & Mfg. Co., North East, Pa. Paste and Stick.
Brunner Chemical Wks., 217 E. 3rd, Cincinnati, O.
Callahan & Co., Geo., 218 Front, New York. (Fluid.)
Central Stamping Co., 206 Broadway, New York, N. Y. Paste and Salts.
Challenge. See Highland Electro Chemical Co.
Conductalute. See Technical Products Co.
Crescent. See McGill Mfg. Co.
Diamond. See Burnley Battery & Mfg. Co.
Dielectric Mfg. Co., St. Louis, Mo.
Dunton Co., M. W., Providence, R. I.
Dutch-Brand. See Van Cleef Bros.
Eureka. See Grasselli Chemical Co.
Firth Radio Corp., 25 Beaver, New York, N. Y.
Fluxite. See Monarch Products Co.
Garden City Laboratory, 300 W. Adams, Chicago, Ill.
General Elec. Co., Merchandise Dept., Bridgeport, Conn. (Paste).
Grasselli Chemical Co., Guardian Bldg., Cleveland, O.
Highland Electro Chemical Mfg. Co., Connellsville, Pa. (Paste, Stick, Salts.)
Incomparable. See Reade Mfg. Co.
Leveridge, Inc., Chas. W., 246 Fulton, New York, N. Y
Luco. See Lukens Metal Co.
Lukens Metal Co., T. F., 1105 Fairmount Ave., Philadelphia, Pa.
McGill Mfg. Co., Valparaiso, Ind. Fluid.
Mitchell-Rand Mfg. Co., 19 Vesey, New York. (Paste.)
Monarch Products Co., Red Bank, N. J.
Neutral. See Dielectric Mfg. Co.
New-Idea. See Hartwig Co., Wm. J.
Nokorode. See Dunton Co., M. W.
Oakwood. See Weaver Specialty Co.
Paragon Insulating Co. 5716 Euclid Ave., Cleveland, O.
Perfecto. See Firth Radio Corp.
Pfanstiehl Chemical Co., Waukegan, Ill. Paste, Salts Sticks, Fluid, Oil, and Solid Sal Ammoniac.
Queens. See Brunner Chemical Works.
Reade Mfg. Co., 133 Hoboken Ave., Jersey City, N. J (Fluids, Salts, Paste).
Redens. See Reade Mfg. Co.
Red-Letter. See Ruby Chemical Co.
Rodale Mfg. Co., 200 Hudson, New York, N. Y. (Paste.)
Rotax Mfg. Co., 380 E. 133rd, New York, N. Y.
Ruby Chemical Co., Columbus, O.
Ruby Fluid. See Ruby Chemical Co.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Salbrick. See American Solder & Flux Co.
Snarr & Co., Geo. W., 110 S. Ninth, St. Louis, Mo. (Paste.)
Snowflake. See Grasselli Chemical Co.
Snowflake. See Highland Electro Chemical Co.
Solderine. See Central Stamping Co.
Solderite, Inc., 22 Green, Newark, N. J.
Speco. See Pfanstiehl Chemical Co.
Standard. See Grasselli Chemical Co.
Star. See McGill Mfg. Co.
Superior. See Highland Electro Chemical Co.
Technical Products Co., Pittsburgh, Pa. (Paste.)
Tinol. See American Solder & Flux Co.
Van Cleef Bros., 7722 Woodlawn Ave., Chicago, Ill.
Weaver Specialty Co., 6344 Aurelia, Pittsburgh, Pa.
Yager's. See Benson Co., Alex. R.
Yankee. See Leveridge, Inc., Chas. W.

SOLDERING IRONS

Acme Elec. Heating Co., Dept. R, 1217 Washington, Boston.
Adroit. See Adrola Corp.
Adrola Corp., Port Jefferson, N. Y.
American Beauty. See American Elecl. Heater Co.
American Elecl. Heater Co., Detroit, Mich.
B-D. See Bleadon-Dun Co.
Beardsley & Wolcott Mfg. Co., Waterbury, Conn.
Beckwith Machine Co., 402 N. Chestnut, Ravenna, Ohio.
Betsy Ross. See Central Flatiron Mfg. Co.
Bleadon-Dun Co., 2300 Warren Ave., Chicago, Ill.
Brach Mfg. Corp., L. S., Newark, N. J.
Burnley Battery & Mfg. Co., North East, Pa.
Central Flatiron Mfg. Co., Johnson City, N. Y.
Chapman Machine Co., Terryville, Conn.
Cutler-Hammer, Inc., 1288 St. Paul Ave., Milwaukee.
Davis Specialty Works, East Gary, Ind.
Dominion Elec'l Mfg. Co., 712 Ontario Ave., N., Minneapolis.
Dover Mfg. Co., Dover, O.
Drake Elec. Wks., 3943 Lincoln Ave., Chicago, Ill.
Edison Elec. Appliance Co., 5618 W. Taylor, Chicago, Ill
Electrahot Mfg. Co., 525 S. 4th, Minneapolis, Minn.
Electric Heat Control Co., 5902 Carnegie Ave., Cleveland. (Transformer Soldering Outfit.)
Electric Soldering Iron Co., Inc., 135 W. 17th, New York.
Electrical Products Mfg. Co., Providence, R. I.
Enco. See Electrical Necessities Corp.
Esico. See Electric Soldering Iron Co.
Everhot. See Swartzbaugh Mfg. Co.
Ever-Ready. See Gold Seal Elec. Co.
General Electric Co., Schenectady, N. Y.
Gold Seal Elecl. Co. of Ohio, Inc., 250 Park Ave., New York, N. Y.
Home. See Majestic Elec. Appliance Co.
Illinois Stamping & Mfg. Co., 220 N. Jefferson, Chicago, Ill.
Industrial. See Fermway Mfg. Co.
Jiffy. See Koch & Co., Paul W.
Junior. See Drake Elec. Wks.
King. See Electric Heat Control Co.
Koch Co., Paul W., 23 S. Wells, Chicago. (Solder Dipper).
Landers, Frary & Clark, New Britain, Conn.
Lenk Mfg. Co., 30 Merrimac, Boston, Mass.
Lotan. See Simplex Flux & Solder Co. of America.
Lucifer. See Jones Point Tool & Elec. Co.
Majestic Electric Appliance Co., San Francisco, Cal.
Manning-Bowman & Co., Meriden, Conn.
Mechanics. See Drake Elec. Wks.
Moto-Ray Mfg. Co., 169 Massachusetts Ave., Boston, Mass.
National Specialties Co., Howell & Tyler Sts., Fort Wayne, Ind.
Northern Elec. Co., 2833 N. Western Ave., Chicago, Ill.
Queen Quality. See Watlow Elec. Mfg. Co.
Quick-Hot. See Moto-Ray Mfg. Co.
Radio. See Drake Elec. Wks.
Regular. See National Specialties Co.
Reliance. See Landers, Frary & Clark.
Samson Cutlery Co., 8 Jones St., Rochester, N. Y.
Silver King. See Illinois Stamping & Mfg. Co.
Simplex Flux & Solder Co. of America, 1965 E. 66th, Cleveland, O.
Superior Elec. Products Corp., 1300 S. 13th, St. Louis, Mo.
Swartzbaugh Mfg. Co., 1501 W. Bancroft, Toledo, O.
Torrid. See Beardsley & Wolcott Mfg. Co.
Trent, Harold E., 295 N Lawrence, Philadelphia, Pa.
Varick Elec. Mfg. Co., 28 E. 21st St., New York, N. Y.
Vulcan Elec Heating Co., 225 Varick, New York, N. Y.
Waage Elec. Co., 5100 W. Ravenswood Ave., Chicago, Ill.
Ward Mfg. Co., 937 Wellington Ave., Chicago, Ill.
Watlow Elec. Mfg. Co., 1320 N. 23rd, St. Louis, Mo.
Wellmade Elec. Co., Torrington, Conn.

SOLDERING MACHINES, Commutator

(For production soldering of small commutators).
Allatonce. See Chapman Electric Works, P. E.
Chapman Electric Works, P. E., 1820 Chouteau Ave., St Louis, Mo.

SOLENOIDS. See Coils

SOLVENTS & REDUCERS, VARNISH. See Paint, Varnish, Lacquer.

SPAGHETTI. See Tubing, Varnished Fabric.

SPEED CHANGING UNITS. See Gears (Speed Changing Units).

SPEED INDICATORS. See Tachometers.

SPOOLING MACHINES, WIRE. See Wire Manufacturing Machines.

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Basco. See Simons Paint Spray Brush Co.
Beach Air Brush Co., Willard C., Harrison, N. J.
Binks Spray Equipment Co., 3120 Carroll Ave., Chicago, Ill.
De Vilbiss Mfg. Co., 3750 Detroit Ave., Toledo, Ohio.
Eclipse Air Brush Co., 79 Orange, Newark, N. J.
Electric Sprayit Co., 320 E. Colfax Ave., South Bend, Ind.
Eureka Sprayers, Inc., 87-28 130th, Long Island City, N. Y.
Ideal Air Brush Mfg. Co., 208 Lafayette, New York, N. Y.
Kellogg Mfg. Co., 97 Humboldt, Rochester, N. Y.
Koch Bros. Mfg. Co., 2339 Nelson, Chicago, Ill.
K B. See Koch Bros. Mfg. Co.
Metal Specialties Mfg. Co., 338 N. Kedzie Ave., Chicago.
Macleod Co., 2232 Bogen, Cincinnati, O.
Paasche Air Brush Co., 1909 Diversey Parkway, Chicago, Ill.
Paint-O-Mister. See Atomister Corp.
Pioneer Air Compressor Co., 243 Canal, New York, N. Y.
Presto. See Metal Specialties Mfg. Co.
Reliable Mfg. Co., Dwightway & Fourth St., Berkeley, Cal.
Simons Paint Spray Brush Co., 17 Maryland Ave., Dayton, O.
Simplex Spray Equipment Co., 552 W. Lake, Chicago, Ill.
Spray-All. See United States Air Compressor Co.
Sprayit. See Electric Sprayit Co.
United States Air Compressor Co., 5300 Howard Ave., Cleveland, O.
Wold Air Brush Mfg. Co., 2173 N. California Ave., Chicago, Ill.

SPREADERS, COIL & LOOP. See Winding Machines, Armature & Field Coil.

SPRING MAKING MACHINES

Sleeper & Hartley, Inc., Worcester, Mass.

SPRINGS

Advance Spring & Wire Co., Carroll Ave. & Wood St., Chicago.
Barnes Co., Wallace, Bristol, Conn.
Barnes-Gibson-Raymond, Inc., 6400 Miller Ave., Detroit, Mich.
Cary Spring Works, Inc., 140 W. 29th St., New York, N. Y.
Cleveland Wire Spring Co., Cleveland, O.
Cook Spring Co., Ann Arbor, Mich.
Cuyahoga Spring Co., Berea Rd., Cleveland, O.
Dunbar Bros. Co., Bristol, Conn.
Eureka Tinware Mfg. Co., 135 W. 20th, New York, N. Y.
Fischer Spring Co., Chas., 238 Kent Ave., Brooklyn, N. Y.
Gibson Co., Wm. D., 1800 Clybourn Ave., Chicago, Ill.
Hubbard Spring Co., M. D., Pontiac, Mich.
Lee Spring Co., 34 Main, Brooklyn, N. Y.
Miller & Van Winkle, Inc., 18 Bridge, Brooklyn, N. Y.
Hunter Pressed Steel Co., Landsdale, Pa.
Newcomb Spring Corp., 234 40th, Brooklyn, N. Y.
Peck Spring Co., Plainville, Conn.
Peterson Spring Co., 1660 Beard Ave., Detroit, Mich.
Rapid Spring Co., 222 Second Ave., Pittsburgh, Pa.
Raymond Mfg. Co., Corry, Pa.
Standard Spring and Manufacturing Co., 236-42nd St., Brooklyn, N. Y.
Steinen & Co., 297 Washington, Newark, N. J.
Young Industries, Inc., L. A., Detroit, Mich.

STAMPED BOXES. See Cabinets, Sheet Steel.

STAMPINGS, Fibre. See Fibre.
Sheet Metal. See Fixture Fittings.
Sheet Steel. See Stampings, Sheet Steel.
Small. See Stampings, Small.

STAMPINGS, Sheet Steel

Heavy Stamping and Drawing.
Acklin Stamping Co., 1925 Nebraska, Toledo, O.
American Stamping Co., 978 E. 64th, Cleveland, O.
Bossert Corp., 1002 Oswego St., Utica, N. Y.
Bossert Corp., Utica, N. Y.
Eureka Tinware Mfg. Co., 135 W. 20th, New York, N. Y.
Faries Mfg. Co., Decatur, Ill.
Fischer Spring Co., Chas., 238 Kent Ave., Brooklyn, N. Y.
Geuder, Paeschke & Frey, St. Paul & 15th, Milwaukee.
Hubbard & Co., Pittsburgh, Pa.
Janney, Jr., Joseph A., 1421 Chestnut St., Philadelphia.
Massachusetts Machine Shop, Inc., Boston, Mass.
Mathews Mfg. Co., 104 Gold, Worcester, Mass.
Metropolitan Devices Corp., 1250 Atlantic Ave., Brooklyn.
Mullins Mfg. Corp., Washing Machine Division, Salem, Ohio. (Vitreous Enameled)
Thomas & Skinner Steel Products Co., 1102 E. 23rd, Indianapolis, Ind.
Truscon Steel Co., Youngstown, O.
United States Stamping Co., Moundsville, W. Va.

STAMPINGS, Small

Small Stamped Metal Parts for Electrical Devices.
Advance Tool & Die Casting Co., 1654 Holton, Milwaukee.
Aerial Machine & Tool Co., 79 Grand, New York, N. Y.
American Radio Hardware Co., 135 Grand, New York, N. Y.
American Stamping Co., 978 E. 64th, Cleveland, O.
Arrow Automatic Products Corp., 27 Vestry, New York, N. Y.
Barnes Co., Wallace, Bristol, Conn.
Beaver Mfg. Co., 625 N. Third, Newark, N. J.
Bridgeport Brass Co., 774 E. Main, Bridgeport, Conn.
Bull Dog Electric Products Co., Detroit, Mich.
Chase Brass & Copper Co., Waterbury, Conn.
Clarke Metal Products, Inc., 490 Hancock Ave., Bridgeport, Conn.
Elco Tool & Screw Corp., Rockford, Ill.
Eureka Tool & Machine Co., Newark, N. J
Faries Mfg. Co., Decatur, Ill.
Fischer Spring Co., Chas., 238 Kent Ave., Brooklyn, N. Y.
Geuder, Paeschke & Frey, St. Paul & 15th, Milwaukee.
Grammes & Sons, Inc., L. F., Allentown, Pa.
Gray Bros. Co., Plano, Ill.
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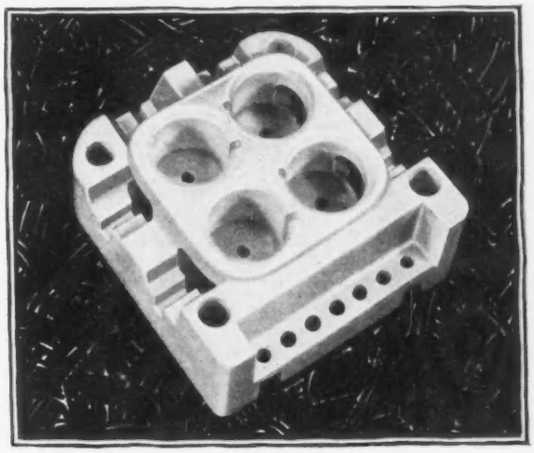

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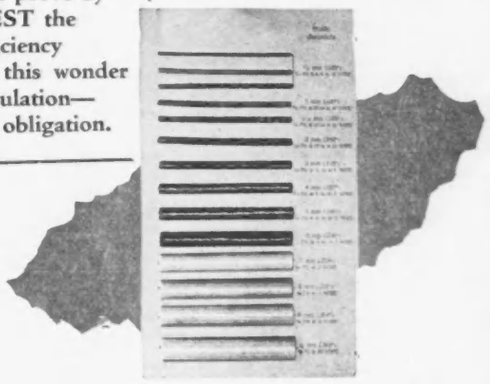

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Mechanics Tool & Stamping Co., 7 Summer, Worcester, Mass.
Mutual. See Bull Dog Elec. Products Co.
Patton-MacGuyer Co., Providence, R. I.
Paul & Beekman Mfg. Co., 1734 N. Fifth, Philadelphia, Pa.
Plume & Atwood Mfg. Co., 474 Bank, Waterbury, Conn.
Precision Metal Workers, 3100 Carroll Ave., Chicago, Ill.
Premax Products, Inc., 230 Tenth, Niagara Falls, N. Y.
Quadriga Mfg. Co., 213 W. Grand Ave., Chicago, Ill.
Risdon Mfg. Co., Naugatuck, Conn.
Scovill Mfg. Co., Waterbury, Conn.
Sherman Mfg. Co., H. B., Battle Creek, Mich.
Signal Elec. Mfg. Co., Menominee, Mich.
Sos Mfg. Co., Roselle, N. J.
Steinen & Co., 297 Washington, Newark, N. J.
Thomas & Skinner Steel Products Co., 1102 E. 23rd, Indianapolis, Ind.
United Stamping & Mfg. Co., Cleveland, Ohio.
United States Stamping Co., Moundsville, W. Va.
Valley Appliances, Inc., 634 Lexington Ave., Rochester, N. Y.
Waterbury Brass Goods Corp., Waterbury, Conn.
Waterbury Button & Moulding Co., Waterbury, Conn.
Waterbury Mfg. Co., 236 Grand, Waterbury, Conn.
Waterbury Metal Wares Co., Waterbury, Conn.
Western Cartridge Co., East Alton, Ill.
Zierick Machine Wks., F. R., 68 E. 131st St., New York, N. Y.

STANDS, Armature

Columbia Machine Works & Malleable Iron Co., Atlantic Ave. and Chestnut St., Brooklyn, N. Y.
Electric Service Supplies Co., 17 & Cambria Sts., Philadelphia, Pa.
Oman, David W., 43 Royalstone Ave., Minneapolis, Minn.
Peerless. See Electric Service Supplies Co.
Ridlon Company, Frank, Boston, Mass.
Weidenhoff, Joseph, 4352 Roosevelt Rd., Chicago, Ill.

STARTERS, Motor. See Controllers, Motor; Switches, Remote Control; Switches, Knife; Safety; Switches, Snap (Heavy Duty).

STEATITE. See Cores, Resistance Coil.

STEEL CASTINGS. See Castings, Steel.

STEEL for Electric Appliances

Elyria Iron & Steel Co., Elyria, O.
Ryerson & Son, Jos., 2558 W. 16th, Chicago, Ill.

STEEL, Magnet

Ajax Electrothermic Corp., Trenton, N. J.
Hercules Elec. Steel Corp., 145 Lafayette St., New York.
Indiana Steel Products Co., 4545 S. Western Ave., Chicago.
Ludlum Steel Co., Watervliet, N. Y.
Reed Co., Jr., David, 85 Adams, Brooklyn, N. Y.
Swedmag. See Reid Co., Jr., David.

STEEL SHEETS

Agathon. See Central Alloy Steel Corp.
Allegheny Steel Co., Brackenridge, Pa.
American Rolling Mill Co., Middleton, Ohio.
American Sheet & Tin Plate Co., Frick Bldg., Pittsburgh.
Armco. See American Rolling Mill Co.
Armelec. See Empire Steel Corp.
Central Alloy Steel Corp., Massillon, O.
Cyclops Steel Co., Titusville, Pa.
Dynelec. See Empire Steel Corp.
Empire Steel Corp., Mansfield, O.
Firth-Sterling Steel Co., McKeesport, Pa.
Manelec. See Empire Steel Corp.
Metelec. See Empire Steel Corp.
Newport Rolling Mill Co., Newport, Ky.
Polelec. See Empire Steel Corp.
Republic Iron & Steel Co., 335 Market, Youngstown, O.
Tranelec. See Empire Steel Corp.
Uniloy. See Universal Steel Co.
Universal Steel Co., Bridgeville, Pa.
Wheeling Steel Corp., Wheeling, W. Va.

STEEL, STRIP. See Strip Steel.

STOCKS, Dies and Reamers

Hall-Will, Inc., Twelfth & Cranberry, Erie, Pa.
Red-E-Hall. See Hall-Will, Inc.
Toledo Pipe Threading Machine Co., 1445 Summit, Toledo, O.

STONES, Commutator

Acme. See Green Equipment Corp.
Caro. See Electric Service Supplies Co.
Cleveland Stone Co., Union Trust Bldg., Cleveland, O.
Co-operative Utilities Co., 1503 Columbia Ave., Philadelphia, Pa.
Diamond Dee. See Co-operative Utilities Co.
Electric Service Supplies Co., 17th and Cambria, Philadelphia, Pa.
Green Equipment Corp., Monadnock Block, Chicago, Ill.
Ideal Commutator Dresser Co., 1039 Park Ave., Sycamore, Ill.
Imperial. See Martindale Electric Co.
Lombard & Co., Somerville, Mass.
Martindale Elec. Co., 1262 W. Fourth, Cleveland, O.

STOOLS, Factory; Steel

Angle Steel Stool Co., Plainwell, Mich.
Chicago Wire Chair Co., 613 N. La Salle, Chicago, Ill.
Royal Metal Mfg. Co., 1136 South Michigan Ave., Chicago.

STORAGE
Battery Plates. See Plates, Storage Battery.
Battery, Separators. See Separators.
Tools. See Tools, Storage Battery.

STRAINING MACHINES, INSULATION. See Wire Manufacturing Machines.

STRAIGHTENERS, Armature Shaft

Columbia Machine Works & Malleable Iron Co., Atlantic Ave. and Chestnut St., Brooklyn, N. Y.

STRANDING MACHINES. See Wire Manufacturing Machines.

STRIP STEEL

(Hot and Cold Roll).
Acme Steel Co., 2840 Archer Ave., Chicago, Ill. (Hot & Cold).
American Steel & Wire Co., 208 S. La Salle, Chicago, Ill (Cold).
Athenia Steel Co., 135 William, New York, N. Y. (Cold.)
Barnes Co., Wallace, Bristol, Conn. (Hot.)
Central Alloy Steel Corp., Massillon, O. (Hot.)
Griffin Mfg. Co., Huron & Cherry, Erie, Pa. (Cold.)
Laclede Steel Co., 8th & Olive Sts., St. Louis, Mo. (Hot.)
Latrobe Electric Steel Co., Latrobe, Pa. (Hot & Cold.)
Republic Iron & Steel Co., 335 Market, Youngstown, O.
Sharon Steel Hoop Co., Sharon, Pa. (Hot.)
Stanley Wks., New Britain, Conn. (Hot & Cold.)
Steel and Tubes, Inc., Cleveland, O. (Hot & Cold.)
Superior Steel Corp., Union Trust Bldg., Pittsburgh, Pa. (Hot & Cold.)
Thomas Steel Co., Warren, Ohio.
West Leechburg Steel Co., Farmers Bank Bldg., Pittsburgh, Pa. (Hot & Cold.)

STRIPPERS, Wire

Acme. See A. Laubscher.

Artos Engineering Co., 115 Brown, Milwaukee, Wis. (Cutting, Stripping and Measuring).
Austin Co., M. B., 108 S. Desplaines, Chicago, Ill.
Colonial-Premier Co., 229 W. Ohio, Chicago, Ill.
Dicke Tool Co., Downers Grove, Ill.
Electric Service Supplies Co., 17th & Cambria Sts., Philadelphia, Pa.
E-Z. See Pyramid Products Co.
F. F. See France Mfg. Co.
France Mfg. Co., 10825 Berea Rd., Cleveland. (Motor Driven.)
Goehst. See Klein & Sons.
Hartman. See Service Sales & Mfg. Co.
Ideal Commutator Dresser Co., 1008 Park Ave., Sycamore, Ill.
Ives Mfg. Co., Meriden, Conn.
Klein & Sons, Mathias, Chicago, Ill.
Laubscher, A., 77 Fort Pleasant Ave., Springfield, Mass.
Perfection. See Weber Machine Corp.
Pyramid Products Co., 2311 S. State, Chicago, Ill.
Service Sales & Mfg. Co., 17005 Melgrave Ave., Cleveland, Ohio.
Speedcraft. See Wire Stripper Co.
Thomas Steel Products Co., Warren, Ohio.
Weber Machine Corp., 33 S. Water, Rochester, N. Y.
Wire Stripper Co., 507 Erie Bldg., Cleveland, O.
Zierick Machine Wks., F. R., 6 Howard, New York City. (Motor Driven Stripper & Twister).

SWITCHBOARD INSTRUMENTS. See Instruments, Portable and Switchboard.

SWITCHBOARD OPALS. See Lenses.

SWITCHBOARDS, SLABS AND BARRIERS
See Asbestos Slabs; Molded Insulation; Slate; Soapstone.

SWITCH (Switches)
Arms. See Posts, Binding.
"Across the Line" Type. See Controllers, Motor.
Baby Knife. See Switches, Battery.
Battery. See Switches, Battery.
Canopy. See Switches, Snap.
Clock Operated. See Switches, Time.
Feed Through. See Switches, Snap.
Fixture. See Switches, Snap.
Float. See Switches, Tank.
Flush. See Switches, Snap.
Handles. See Handles, Wood
Knife, Baby. See Switches, Battery & Baby Knife.
Lever Radio. See Radio Mounting.
Lever. See Switches, Snap, Lever.
Limit. See Controllers, Motor.
Mercury. See Switches, Mercury
Motor Starting. Magnetic Type. See Controllers.
Motor Starting. Non-Magnetic. See Switches, Motor Starting.
Pendant. See Switches, Snap.
Pressure Regulating. See Controllers.
Push Button, Snap. See Switches, Snap.
Push Button, Motor Starting. See Switches, Remote Control.
Radio Receiver. See Radio Mountings.
Range. See Switches Snap; Heavy Duty
Remote Control. See Switches, Remote Control.
Reversing. See Controllers.
Rotary. See Switches, Snap.
Safety. See Switches, Knife.
Snap. See Switches, Snap.
Starting Type. See Controllers.
Storage Battery. See Switches, Storage Battery.
Surface. See Switches, Snap.
Tank. See Switches, Tank
Time. See Switches, Time.
Toggle. See Switches, Snap.
Tumbler. See Switches, Snap.

SWITCHES, Battery and Baby Knife

Cut-Out Switches.
Anti-Wood. See Kell & Son, Francis.
Bridgeport Switch Co., 209 Center, Bridgeport, Conn.
Bryant Electric Co., Bridgeport, Conn.
Chapman. See Frank W. Morse & Co.
Chicago Elec. Mfg. Co., 2801 S. Halsted, Chicago, Ill.
Chicago-Jefferson Fuse & Elec. Co., 1505 W. 15th, Chicago.
Circle T. See Trumbull Elec. Mfg. Co.
Connecticut Elec. Mfg. Co., Bridgeport, Conn.
Crown. See Edwards & Co., Inc.
Cutler-Hammer, Inc., 1288 St. Paul Ave., Milwaukee.
Diamond H. See Hart Mfg. Co.
Edwards & Co., Inc., 140th & Exterior, New York, N. Y.
Electrad, Inc., 428 Broadway, New York, N. Y.
Eureka. See Frank W. Morse & Co.
Fahnestock Elec. Co., cor. East Ave. and 8th, Long Island City, N. Y.
Handy. See Chicago Elec. Mfg. Co.
H. & H. See Hart & Hegeman Div.
Hart Mfg. Co., Hartford, Conn.
Hart & Hegeman, Div. of Arrow-Hart & Hegeman Elec. Co. Hartford, Conn. (Push Button.)
Harwood. See Frank W. Morse & Co.
Heinemann Elec. Co., Trenton, N. J.
Jost. See Frank W. Morse & Co.
Kappa. See Trumbull Elec. Mfg. Co.
Kell & Son, Francis, 401 E. 163rd, New York, N. Y.
Kendrick & Davis Co., Lebanon, N. H.
Keystone. See Frank W. Morse & Co.
King Mfg. Co., B. C., 302 Park Ave., Brooklyn, N. Y.
Knox Porcelain Corp., Knoxville, Tenn.
K-P-F Elec. Co., 855 Howard St., San Francisco, Cal.
Kurz & Root, Appleton, Wis.
Leviton Mfg. Co., 226 Newell, Brooklyn, N. Y.
Lyons Mfg. Co. (Mt. Carmel), New Haven, Conn.
Majestic Elec. Mfg. Co., 80 N. 12th St., St. Louis, Mo.
Manhattan Elecl. Supply Co., 510 Sixth Ave., New York.
Morse Co., Frank W., Boston, Mass.
Partrick & Wilkins Co., Philadelphia, Pa.
Porcelain Products, Inc., Findlay, Ohio.
Powerlite Switchboard Mfg. Co., 4149 E. 79th, Cleveland, O.
Pullrite. See Frank W. Morse & Co.
Reliable Electric Co., 3145 Carroll Ave., Chicago, Ill.
Samson Electric Co., Canton, Mass.
Spero Elec. Mfg. Co., E. 33rd and Woodland Ave., Cleveland
Sta-Rite. See Frank W. Morse & Co.
Trumbull Elec. Mfg. Co., Plainville, Conn.
Wood Elec. Co., C. D., 565 Broadway, New York, N. Y.

SWITCHES, Mercury

(For Temperature Control Apparatus.)
Con-Tac-Tor. See Time-O-Stat Controls Co.
Cooper Hewitt Electric Co., 410 Eighth Ave., Hoboken, N. J.
Cramblet Engineering Div. of Time-O-Stat Controls Co., 286 Milwaukee, Milwaukee, Wis.
Febrice Thermostatic Control Co., 4750 Sheridan Rd., Chicago, Ill.
General Kontroler Co., 200 E. First, Dayton, O.
Kon-nec-tor. See Cooper Hewitt Elec. Co.
Kontax. See General Kontroler Co.
Mercoid Corp., 564 W. Adams, Chicago, Ill.
Safety Regulator Co., 529 S. Mathews, Los Angeles, Cal.
Time-O-Stat Controls Co., Elkhart, Ind.

SWITCHES, Motor Starting

Accessible. See Trumbull-Vanderpoel Elec. Mfg. Co.
Aces. See Colt's Patent Fire Arms Mfg. Co.
Adam Elec. Co., Frank, St. Louis, Mo.
Aurora Steel Products Co., Aurora, Ill.

Automatic Switch Co., 154 Grand, New York, N. Y.
Barber Elec. Mfg. Co., North Attleboro, Mass.
Bull Dog Electric Products Co., Detroit, Mich.
Circle T. See Trumbull Elec. Mfg. Co.
Colt's Patent Fire Arms Mfg. Co., Hartford, Conn.
Columbia Metal Box Co., 226 E. 144th, New York, N. Y.
Crouse-Hinds Co., Syracuse, N. Y.
E. W. See Trumbull Elec. Mfg. Co.
FA. See Adam Elec. Co., Frank.
F. A. Triumph. See Metropolitan Elec. Mfg. Co.
Federal Steel Products Co., 2 Ave. L., Newark, N. J.
Large-Dall Mfg. Co., 806 Cherry, Philadelphia, Pa.
Leonard Elec. Mfg. Co., 2907 Perkins Ave., Cleveland, O.
Lundy Co., E. A., Fulton Bldg., Pittsburgh.
MacMillen Mfg. Co., 1400 N. Spring, Los Angeles, Cal.
Major. See Adam Elec. Co., Frank.
Mason. See Trumbull-Vanderpoel Elec. Mfg. Co.
Metropolitan Device Corp., 1250 Atlantic Ave., Brooklyn, N. Y.
Metropolitan Elec. Mfg. Co., Blvd. at 14th, Long Island City, N. Y.
Murray. See Metropolitan Device Corp.
Mutual. See Bull Dog Elec. Products Co.
Naro. See Metropolitan Elec. Mfg. Co.
Noark. See Colt's Patent Fire Arms Mfg. Co.
Nubiade. See Colt's Patent Fire Arms Mfg. Co.
Palmer Elec. & Mfg. Co., Waltham, Mass.
Robbins & Myers, Inc., Springfield, O.
Safe-Lock. See Trumbull-Vanderpoel Elec. Mfg. Co.
Safelock. See Westinghouse Elec. & Mfg. Co.
Schmuckler & Sons, 2323 N. 28th, Philadelphia, Pa.
Square D Co., Detroit, Mich.
S. S. See Wadsworth Elec. Mfg. Co.
Tanner & Co., Wm. F., 511 Sharp, Baltimore, Md.
Trumbull Elec. Mfg. Co., Plainville, Conn.
Trumbull-Vanderpoel Elec. Mfg. Co., Bantam, Conn.
T. V. Safelock. See Trumbull-Vanderpoel Elec.
Unisafti. See Metropolitan Device Corp.
Unit-Versal. See Bull Dog Elec. Products Co.
Universal Metal Box & Products Co.
V. V. Fittings Co., 711 Cherry, Philadelphia, Pa.
Wadsworth Elec. Mfg. Co., Covington, Ky.
Westinghouse Elec. & Mfg. Co., Mansfield, O.

SWITCHES, Remote Control

Push Button, Magnetically Operated.
Adam Electric Co., Frank, St. Louis, Mo.
Allen-Bradley Co., 494 Reed, Milwaukee, Wis.
Automatic Switch Co., 154 Grand, New York, N. Y.
Burke Controller Co., 369 Lexington Ave., New York, N. Y.
Clark Controller Co., 1146 E. 152nd, Cleveland, O.
Cramer & Co., R. W., 136 Liberty, New York, N. Y.
Cutler-Hammer, Inc., 1237 St. Paul Ave., Milwaukee.
Diamond H. See Hart Mfg. Co.
Dunco. See Struthers Dunn, Inc.
Electric Valve Mfg. Co., 68 Murray, New York, N. Y.
General Electric Co., Merchandise Dept., Bridgeport, Conn.
Hart Mfg. Co., Hartford, Conn.
H. P. See Palmer Elec. & Mfg. Co.
Industrial Controller Div. of Square D Co., Milwaukee, Wis.
Kato Engr. Co., Mankato, Minn.
Lincoln Elec. Co., Colt Rd. & Kirby Ave., Cleveland, O.
Major, F. A., System. See Adam Elec. Co.
Monitor Controller Co., 51 S. Gay, Baltimore, Md.
Palmer Elec. & Mfg. Co., Waltham, Mass.
Precise Mfg. Co., 254 Mill, Rochester, N. Y.
Protectoswitch. See Precise Mfg. Co.
R. C. O. C. See South Bend Current Controller Co.
Sauter. See Cramer & Co., R. W.
Signal Engineering & Mfg. Co., 146 W. 14th, New York.
South Bend Current Controller Co., South Bend Ind.
Struthers Dunn, Inc., 1135 Race, Philadelphia, Pa.
Takamine Corp., 208 Rawson St., Long Island City, N. Y.
Teeple Co., L. R., 540 E. Ninth, Portland, Ore.
Triplock. See Monitor Controller Co.
Trumbull Elec. Mfg. Co., Plainville, Conn.
Zenith Elec. Co., 537 S. Dearborn, Chicago, Ill.

SWITCHES, Snap

	KEY
Feed Through	See p
Fixture (Canopy, Candelabra and Key Arm)	See F
Flush	See f
Lever, Toggle, Tumbler	See L
Pendant	See p
Push Button	See P
Rotary	See R
Surface	See s

See Also Switches, Snap; Heavy Duty.

Adam Electric Co., Frank, St. Louis, Mo.							
Anylite Elec. Co., Ft. Wayne, Ind.						L	
Arrow Electric Div. of Arrow-Hart & Hegeman Elec. Co., Hartford, Conn.	f	sp	P	R	L	F	
Arrow Head. See Arrow Elec.							
Beaver Mfg. Co., 625 N. Third, Newark, N. J.	f	p	P			F	
Best. See United States Elec. Mfg. Corp.							
Brascolite. See Guth & Co., Edwin.							
Bremer Elec. Mfg. Co., 139 N. 7th, Philadelphia, Pa.	f						
Bridgeport Switch Co., 209 Center, Bridgeport, Conn.						L	F
Bryant Elec. Co., Bridgeport, Conn.	f	sp	P	R	L	F	
B. S. Co. See Bridgeport Switch Co.							
Carling Tool & Machine Co., 32 Union Place, Hartford, Conn.							F
Commercial. See Gaynor Electric Co.							
Connecticut Elec. Mfg. Co., Bridgeport, Conn.		p	P	R	L	F	
Crouse-Hinds Co., Syracuse, N. Y.						L	
Cutler-Hammer, Inc., 1288 St. Paul Ave., Milwaukee, Wis.		P			L		
Diamond H. See Hart Mfg. Co.							
Dugle. See Bryant Elec. Co.							
Economy Fuse Mfg. Co., 2717 Greenview Ave., Chicago, Ill.							F
Gaynor Elec. Co., Stratford, Conn.	f					L	
General Elec. Co., Merchandise Dept., Bridgeport, Conn.	f	sp	P	R	L	F	
Glo-Guide. See Bryant Elec. Co.							
Gold Star Push Switch. See Hart & Hegeman.							
Guth & Co., Edwin, 2615 Washington Ave., St. Louis, Mo.							F
Hart Mfg. Co., Hartford, Conn.	f	sp	P	R	L		
Hart & Hegeman, Div. of Arrow-Hart & Hegeman Elec. Co. (Door Bolt Control)	f	sp	P	R	L	F	
Hart. See Hart & Hegeman.							
H. & H. See Hart & Hegeman Mfg. Co.							
Hubbell, Inc., Harvey, Bridgeport, Conn.		sp			L	F	
Jost. See Morse, Frank W.							
Kell & Son, Francis, 401 E. 163rd, New York, N. Y.	f		P				
Leviton Mfg. Co., 226 Newell, Brooklyn							F
Levolier. See McGill Mfg. Co.							
McGill Mfg. Co., Valparaiso, Ind.	f				L	F	
Marks Products Co., 80 N. Ninth, Brooklyn, N. Y.						L	F
Metropolitan Elec. Mfg. Co., Blvd at 14th St., Long Island City, N. Y.		s			B		

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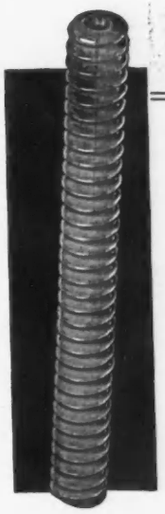

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COLD ROLLED SPRING STEEL — SCREW MACHINE PARTS
SPRING WASHERS — ASSEMBLIES — SMALL STAMPINGS
SPRINGS

SWITCHES, Snap—Continued

Morse Co., Frank W., 291 Congress, Boston . . . P . . . . . .
National. See Standard Elec. Mfg. Co.
New England. See Paulding, John L.
Nutmeg. See Hubbell, Harvey, Inc.
Operite. See Morse Co., Frank W.
Pass & Seymour, Solvay Sta., Syracuse, N. Y. . . . . f sp P . . L F
Paulding, John I., New Bedford, Mass. . . . . f s P . . . . . .
Pen Tap. See Beaver Mfg. Co.
Perkins. See Bryant Elec. Co.
Pilot Radio & Tube Corp., 323 Berry, Brooklyn, N. Y. . . . . L . .
Pilotoggle. See Pilot Radio & Tube Corp.
Pilotoggle. See Pilot Elec. Mfg. Co.
Pullrite. See Morse, Frank W.
Rodale Mfg. Co., 200 Hudson, New York p . . . . . .
Sears, Henry D., 80 Boylston, Boston . . f sp P R L F
Smith & Co., T. C., 3915 Powelton Ave., Philadelphia, Pa. . . . . P . . . . .
Snapit. See Marks Products Co.
Spartan. See Bryant Elec. Co.
Standard Elec. Mfg. Co., 941 Wrightwood Ave., Chicago, Ill. . . . . f r P R L . .
Trigle. See Bryant Elec. Co.
Tumbolier. See Hart & Hegeman.
Twi-Lite. See McGill Mfg. Co.
United States Elec. Mfg. Corp., 232 W. 114th, New York, N. Y. . . . . f . . . . . .
Victor. See Keil & Son, Francis.
Washington. See Gaynor Electric Co.
Weber. See Sears, Henry D.
Werkrite. See Morse, Frank W.
Yankee. See Bryant Elec. Co.

SWITCHES, Snap; Heavy Duty

Heavy duty rotary snap switches for Electric Range and Small Motor Control.

Arrow Elec. Div. of Arrow-Hart & Hegeman Elec. Co., Hartford, Conn.
Bryant Electric Co., Bridgeport, Conn.
Diamond H. See Hart Mfg. Co.
Domestic Electric Co., 7723 St. Clair Ave., Cleveland, Ohio.
General Electric Co., Section W-234, Merchandise Dept., Bridgeport, Conn.
Hart Mfg. Co., Hartford, Conn.
Hart & Hegeman, Div. of Arrow-Hart & Hegeman Elec. Co., Hartford, Conn.

SWITCHES, Storage Battery; Automatic Disconnecting

Cutler-Hammer, Inc., 1288 St. Paul Ave., Milwaukee.
Penn Electric Switch Co., Des Moines, Ia.
Radioloc. See Cutler-Hammer Mfg. Co.

SWITCHES, Tank

Blackburn-Smith Corp., 25 W. 45th, New York, N. Y.
Cutler-Hammer, Inc., 1288 St. Paul Ave., Milwaukee.
Electrical Repair Co., 240 W. 25th, New York, N. Y.
General Electric Co., Schenectady, N. Y.
Industrial Controller Div. of Square D Co., S. Pierce & Hanover Sts., Milwaukee, Wis.
Leader-Trabern Products Co., Decatur, Ill.
Ostrander Elec. Wks., W. R., 911 Atlantic Ave., Brooklyn.
Penn Elec. Switch Co., 20th & Walnut, Des Moines, Ia.
Sundh Elec. Co., Parkhurst St. at Ave. C, Newark, N. J.
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.

SWITCHES, Time (Automatic Clock Operated Switches)

Anderson Mfg. Co., Albert & J. M., 289 A, Boston, Mass.
Astrachron. See Gem Engineering Co.
Automatic Elec. Heater Co., 1505 Race, Philadelphia, Pa.
Automatic Elec. Mfg. Co., Mankato, Minn.
Automatic Lighting Co., 831 Greenmount Ave., Baltimore.
Automatic Sprinkler Corp. of America, 910 B. of L. E. Bank Bldg., Cleveland, Ohio.
Automatic Timer Co., 1841 Euclid Ave., Cleveland, O.
Berry, A. Hall, 73 Murray, New York, N. Y.
Brown & Pengilly, Inc., 1264 Folsom, San Francisco, Cal.
Buckeye Time Switches, Inc., 1557 St. Clair Ave., Cleveland, O.
Cackle. See Berry A. Hall.
Campbell Electric Mfg. Co., 15 Stewart, Lynn, Mass.
Clark. See Automatic Heater Co.
Con-tac-tor. See Absolute Con-tac-tor Corp.
Cramer & Co., R. W., 136 Liberty, New York, N. Y.
Eureka Tool & Machine Co., 42 Walnut, Newark, N. J.
Frisch, Walter P., 104 Linden, Rochester, N. Y.
Gem Engineering Co., Hempstead, N. Y.
General Electric Co., Schenectady, N. Y.
Go-N-Set. See G. & S. Research Lab.
G. & S. Research Laboratory, 1269 Cochran Ave., Los Angeles, Cal.
Hart Mfg. Co., Hartford, Conn.
Hartford. See Berry A. Hall.
Horni Signal Mfg. Co., 290 Hudson, New York, N. Y.
Jewel. See Time Switch Sales & Service.
Knowles, W. E., 2869 Broadway, Oakland, Cal.
Kwikset. See Thompson Clock Co.
Lamp-Lighter. See Robbins & Myers Co.
Liberty Bell Mfg. Co., Minerva, Ohio.
Mercury Time Switch Co., Marine City, Mich.
Northwestern Clock Co., Omaha, Neb.
Ohio Time Switch Co., 1439 St. Clair Ave., Cleveland.
Paragon Elec. Co., 409 S. Dearborn, Chicago, Ill.
Racine. See Reliance Automatic Ltg. Co.
Radio Owl, 2269 E. 51st, Los Angeles, Cal.
Radio Switchman. See R-V Mfg. Co.
Reliance Automatic Ltg. Co, 1925 Meade, Racine, Wis.
Research Mfg. Laboratory, 1269 Cochran Ave., Los Angeles.
Robbins & Myers Co., Springfield, O.
Ross Safety Switch Corp., 1 E. 42nd, New York, N. Y.
R-V Mfg. Co., Marshfield, Mass.
Sauter. See Cramer & Co.
States Co., Hartford, Conn.
Stromberg Electric Co., 223 W. Erie, Chicago, Ill.
Thompson Clock Co., H. C., Bristol, Conn.
Time Switch Sales & Service, 1841 Euclid Ave., Cleveland, O.
Tork Clocks, Inc., 12 E. 41st, New York, N. Y.
Walser Automatic Timer Co., 342 Madison Ave., New York.
Zenith Elec. Co., 537 S. Dearborn, Chicago, Ill.

TACHOMETERS

Speed Indicators, Speedometers, Revolution Counters.

Biddle, James G., 1211 Arch, Philadelphia, Pa.
Brown Instrument Co., Wayne & Windrim, Philadelphia.
Comet Elec. Co., 47 Union Trust Bldg., Indianapolis, Ind.
Durant Mfg. Co., 655 Buffum, Milwaukee, Wis.
Electric Tachometer Corp., Spring Garden & Broad St., Philadelphia, Pa.
Holtzer-Cabot Elec. Co., Boston, Mass.
Leeds & Northrup Co., 4901 Stenton Ave., Philadelphia, Pa.
Productimeter. See Durant Mfg. Co.
Standco. See Stricht & Co.
Stricht & Co., H. H., 21 Park Row, New York, N. Y.
Veeder Mfg. Co., 14 Sargeant, Hartford, Conn.
Weston Elecl. Instrument Co., 582 Frelinghuysen Ave., Newark, N. J.
Zarnickow Co., O., 15 Park Row, New York, N. Y.

TAGS, Cable; Pole and Battery

American Radio Hardware Co., 135 Grand, New York, N. Y. (Battery Lead Tags.)
Benedict Mfg. Co., East Syracuse, N. Y.
Brooklin Underground Elec'l Mfg. Co., Glenside, Pa.
Crowe Name Plate & Mfg. Co., 1749 Grace, Chicago, Ill.
Grammes & Sons, Inc., L. F., Allentown, Pa.
International Tag Co., 319 N. Whipple, Chicago, Ill.
Matthews & Co., Jas. H., 3942 Forbes, Pittsburgh, Pa.
Premax Products, Inc., 230 Tenth, Niagara Falls, N. Y.
Viking Tool & Machine Co., 745 65th, Brooklyn, N. Y.
Waterbury Button & Moulding Co. Waterbury, Conn.

TAGS, Shipping

Campbell Paper Box Co., South Bend, Ind.
International Tag Co., 319 W. Whipple, Chicago, Ill.
TAMPING TOOLS, COIL. See Tools, Commutator Truing.
TANK SWITCHES. See Switches, Tank.
TANKS, TINNING. See Wire Manufacturing Machines.

TAPE, Asbestos

American Asbestos Co., Norristown, Pa.
Asbestos Fibre Spinning Co., North Wales, Pa.
Ferodo & Asbestos, Inc., New Brunswick, N. J.
General Asbestos & Rubber Co., Charleston, S. C.
Johns-Manville Corp., New York, N. Y.
Matthews & Co., Jas. H., 3942 Forbes, Pittsburgh, Pa.
Mitchell-Rand Mfg. Co., 19 Vesey, New York, N. Y.
Niagrite. See Johns-Manville, Inc.
Shield Brand. See Mitchell-Rand Mfg. Co.

TAPE, Cotton, Linen, Silk; Tape, Sleeving, Webbing.

Alfalfa. See Burrell Belting Co.
Anchor Webbing Co., 300 Brook, Pawtucket, R. I. (Cotton, Silk).
Awsco. See Anchor Webbing Co.
Bermaline. See Burrell Belting Co.
Burrell Belting Co., 413 S. Hermitage Ave., Chicago, Ill.
Eagle. See Sidebotham, Inc., John.
General Electric Co., Schenectady, N. Y.
Gilmer Co., L. H., Cottman & Keystone Sts. (Tacony), Philadelphia, Pa.
Hope Webbing Co., 1005 Main, Providence, R. I.
Krout & Fite Mfg. Co., Allegheny Ave. & Emerald, Philadelphia, Pa.
Mitchell-Rand Mfg. Co., 19 Vesey, New York, N. Y.
Pearce Co., R. T., Covington, Ky.
Shield Brand. See Mitchell-Rand Mfg. Co.
Sidebotham, Inc., John, 4317 Griscom, Philadelphia, Pa.
Smith Belting Co. (Germantown), Philadelphia, Pa.
Superfine. See Windsor Webbing Co.
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.
Windsor Webbing Co., Pawtucket, R. I.
Worcester Braiding Co., 34 Southbridge, Worcester, Mass.

TAPE, Mica

Chicago Mica Co., 345 Campbell, Valparaiso, Ind.
Mica Insulator Co., 200 Varick, New York, N. Y.
Mica Mfg. Co., 135 Johnson, Brooklyn, N. Y.
Mitchell-Rand Mfg. Co., 19 Vesey, New York, N. Y.
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.

TAPE, Rubber and Friction

Ackerman. See Ackurate Rubber Co.
Ackurate Rubber Co., 25 Beaver St., New York, N. Y.
Adamson & Co., Joseph, Columbia and Germantown Aves., Philadelphia, Pa.
Adhere. See Westinghouse Elec. & Mfg. Co.
Alpha. See Johns-Manville, Inc.
Amazon. See Graybar Elec. Co.
Appleton Rubber Co., Franklin, Mass.
Black Diamond. See Dunton Co., M. W.
Boston Woven Hose & Rubber Co., Boston, Mass.
Brooklyn. See Johns-Manville, Inc.
Bull-Dog. See Boston Woven Hose & Rubber Co.
Candee. See Ackurate Rubber Co.
Canfield Rubber Co., Bridgeport, Conn.
Canton. See Plymouth Rubber Co.
Clifton. See Clifton Mfg. Co.
Clifton Mfg. Co., 65 Brookside Ave., Boston 30, Mass.
Competition. See New York Insulated Wire Co.
Double-Wear. See Dryden Rubber Co.
Dryden Rubber Co., 1014 S. Kildare Ave., Chicago, Ill.
Dundee, A. & B. See Okenite Co.
Dunton Co., M. W., 670 Eddy St., Providence, R. I.
Dutch-Brand. See Van Cleef Bros.
Elkhart Rubber Wks., Elkhart, Ind.
Firestone Tire & Rubber Co., Akron, O.
General Electric Co., Merchandise Dept., Bridgeport, Conn.
Graybar Elec. Co., Graybar Bldg., Lexington Ave. & 43rd St., New York, N. Y.
Grimshaw. See New York Insulated Wire Co.
Griptite. See Canfield Rubber Co.
Holfast Rubber Co., Atlanta, Ga.
Holditite. See United States Rubber Co.
Hydro-Proof. See Elkhart Rubber Wks.
Imperial Rubber Co., 220 Broadway, New York. N. Y.
Impervo. See Canfield Rubber Co.
Irco. See Imperial Rubber Co.
Johns-Manville Corp., New York, N. Y.
Jomanco. See Johns-Manville, Inc.
Kerite Ins. Wire & Cable Co., 30 Church, New York, N. Y.
Manson. See Okonite Co.
Mitchell-Rand Mfg. Co., 19 Vesey, New York, N. Y.
New York Insulated Wire Co., 114 Liberty, New York, N. Y.
Okonite Co., Passaic, N. J.
O. K. See Appleton Rubber Co.
P. & B. See Ruberoid Co.
Paratex. See Appleton Rubber Co.
Paruco. See Passaic Rubber Co.
Passaic Rubber Co., Clifton, N. J.
Plymouth Rubber Co., 1400 Revere, Canton, Mass.
Red-X. St. Louis Rubber Cement Co.
Rello. See United States Rubber Co.
Ruberoid Co., 95 Madison Ave., New York, N. Y.
S. I. See Superior Insulating Tape Co.
Sitco. See Superior Insulation Tape Co.
Slipknot. See Plymouth Rubber Co.
Star. See Sullivan & Sons Mfg. Co., J.
Sticks. See Graybar Elec. Co.
Stixwell. See Clifton Mfg. Co.
Sullivan & Sons Mfg. Co., J., 2224 N. 9th, Philadelphia, Pa.
Superior Insulating Tape Co., 3044 Lambdin Ave., St. Louis.
2-Plex. See Holfast Rubber Co.
U. S. See United States Rubber Co.
United States Rubber Co., 1790 Broadway, New York, N. Y.
Usco. See United States Rubber Co.
Van Cleef Bros., 7722 Woodlawn Ave., Chicago.
Victer. See Graybar Elec. Co.
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.

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Acme Wire Co., New Haven, Conn.
General Electric Co., Merchandise Dept., Bridgeport, Conn.
Irvington Varnish & Insulator Co., Irvington, N. J.
Mica Insulator Co., 200 Varick, New York, N. Y.
Mitchell-Rand Mfg. Co., 19 Vesey, New York, N. Y.
New Jersey Wood Finishing Co., Woodbridge, N. J.
Radiotape. See Respro, Inc.
Respro, Inc., Wellington Ave. (Auburn), Providence, R. I.
Shield Brand. See Mitchell-Rand Mfg. Co.
Sico. See Standard Insulator Co.
Standard Insulation Co., East Rutherford, N. J.
Voltape. See Respro, Inc.

TAPING MACHINES, Coil

Chapman Electric Works, P. E., 1820 Chouteau Ave., St. Louis, Mo.
Columbia Machine Works & Malleable Iron Co., Atlantic Ave. and Chestnut St., Brooklyn, N. Y.
Electric Service Supplies Co., 17th & Cambria Sts., Philadelphia, Pa.
Griswold Machine Co., George, New Haven, Conn.
Ridion Company, Frank, Boston, Mass.
Segur. See Electric Service Supplies Co.

TAPING MACHINES, Wire

American Insulating Machinery Co., 519 Huntington Ave., Philadelphia, Pa.
Wire Machinery Corp. of Am., New Haven, Conn.
TAPS. See Stocks, Dies and Reamers.
TENSION DEVICES, Coil Wire. See Racks, Wire Reel.

TENSION MACHINES, Band Wire

Electric Service Supplies Co., 17th & Cambria Sts., Philadelphia, Pa.
Peerless. See Electric Service Supplies Co.

TERMINALS AND CONNECTORS

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All-in-One. See Ohio Parts Co.
Barey-Nicholson Co., 2801 Fort, W., Detroit, Mich.
Bassett Metal Goods Co., Derby, Conn. (General Selling Agent, Hatheway & Co., 16 Hudson, New York, N. Y.)
Burton-Rogers Co., Boston, Mass.
Cabelug. See Jones, Howard B.
Clark Metal Products, 490 Hancock Ave., Bridgeport.
Dixie Supply Co., 91 7th Ave., New York.
Double Grip. See Pons, Eugene
Eagle Elec. Mfg. Co., 59 Hall, Brooklyn, N. Y.
Electron. See Bassett Metal Goods Co.
Fahnestock Elec. Co., East Ave. and 8th, Long Island City, N. Y.
Grammes & Sons, Inc., L. F., Allentown, Pa.
Ideal Clamp Mfg. Co., 198 Bradford, Brooklyn, N. Y.
Jones, Howard B., 2226 Wabansia, Chicago, Ill.
K. E. M. See Kulier Elec. Mfg. Co.
Kulier Elec. Mfg. Co., 575 Pierce Ave., Long Island City.
Morse Co., Frank W., Boston, Mass.
Nu-Way Snap. See Hatheway Mfg. Co.
Ohio Parts Co., 3301 Colerain Ave., Cincinnati, O.
Orum, S. B. M., 503 N. 11th, Philadelphia, Pa.
Patton-MacGuyer Co., Providence, R. I.
Pons, Eugene, 927 Campbell Ave., Schenectady, N. Y.
Petersen Co., 7 Beverly, Providence, R. I.
Rajah Co., Bloomfield, N. J.
Salem Elec'l Supply Co., Salem, Mass.
Sherman Mfg. Co., H. B., Battle Creek, Mich.
Shure. See Burton-Rogers Co.
Tinkerbox. See Weber Elec. Wks.
Waterbury Button & Moulding Co., Waterbury, Conn.
Weber Elec. Wks., Brooklyn Sta., Cleveland, O.
Wolverine Tube Co., 1431 Central Ave., Detroit, Mich.
Zierick Machine Wks., F. R., 6 Howard, New York.

TEST BENCHES, Armature

Allen Electric & Equipment Co., Kalamazoo, Michigan.
Burton & Rogers Co., Boston, Mass.
Cowie Electric Co., E. S., 1816 McGee, Kansas City, Mo.
Electric Machine Corp., 529 S. N. J., Indianapolis, Ind.
Hobart Bros. Co., Troy, Ohio.
Marshall Elec. Co., Elkhart, Ind.
Miho Company, 717 Sycamore, Cincinnati, Ohio.
North East Electric Co., Rochester, N. Y.
Pence & Son, H. O., San Luis Obispo, Cal.
Weidenhoff, Joseph, 4352 W. Roosevelt Road, Chicago, Ill.

TESTING INSTRUMENTS. See Instruments.

TESTERS, Coil

(Includes Armature Growlers, trouble shooters, and other portable testing devices). See also Instruments

Ace. See Weidenhoff, Joseph.
Allen-Bradley Co., 494 Reed, Milwaukee, Wis.
Allen Electric & Equipment Co., Kalamazoo, Michigan.
Ankenbrandt, J. J., 2140 Wakeman, Toledo, Ohio.
Armeter. See Chapman Electric Works, P. E.
Bartlett Electric Products Co., Goshen, Ind. (Storage Battery).
Batt-O-Meter. See Indiana Mfg. & Elec. Co., also Case Elec.
Burton & Rogers Co., 857 Boylston, Boston, Mass.
Case Elec. Co., Marion, Ind.
Century Electrical Co., 102 Randall Ave., Syracuse, N. Y.
Chapman Elec'l Works, P. E., 1820 Chouteau Ave., St. Louis, Mo
Colpin Corp., 6110 S. Main, Los Angeles, Cal.
Columbia. See Weidenhoff, Joseph.
Comparometer Co., New Ulm, Minn.
Cowie Electric Co., E. S., 1816 McGee, Kansas City, Mo.
Economy. See Weidenhoff, Joseph.
Electric Controller & Mfg. Co., 2700 E. 79th, Cleveland.
Electric Machine Corp., 529 S. N. J., Indianapolis, Ind.
Electrotest. See Comparometer Company.
Elmco. See Electric Machine Corp.
Ev-Ri-Test. See Weidenhoff, Joseph.
Ga-Jit. See General Instrument Corp.
General Instrument Corp., 225 Varick, New York, N. Y.
Herald Elec. Co., 29 East End Ave., New York, N. Y.
Hobart Bros. Co., Troy, Ohio.
Ideal. See Ankenbrandt, J. J.
Indiana Mfg. & Electric Co., Marion, Indiana.
Kietzman Electrical Mfg. Co., 234 N. Central, Gilman, Ill.
Leich Electric Co., Genoa, Ill.
Lundin Electric Machine Co., 10 Thacher, Boston, Mass.
Mallory Electric Co., Factories Bldg., Toledo, Ohio.
Marshall Elec. Co., Elkhart, Ind.
Miho Company, 717 Sycamore, Cincinnati, Ohio.
North East Electric Co., Rochester, N. Y.
Onan, David W., 43 Royalstone Ave., Minneapolis, Minn.
Paneltest. See Allen Elec. & Equip. Co.
Portometer. See Allen Elec. & Equip. Co.
Portostat. See Allen Elec. & Equip. Co.
Presto. See Metal Specialties Mfg. Co.
Reliable Parts Mfg. Co., Wellington, Ohio.
Rex Batrystat. See Bartlett Products Co.
Scout. See Leich Electric Company.
Servwell Sales Corp., 1749 N. Winchester Ave., Chicago, Ill.
Test-All. See Colpin Corp.
Test-O-Meter. See Weidenhoff, Joseph.
Test-Rite. See Colpin Corp.
Victory. See Weidenhoff, Joseph.
Weidenhoff, Joseph. 4352 W. Roosevelt Rd., Chicago, Ill.

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Rubicon Co., 29 N. Sixth, Philadelphia, Pa.
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Chace Valve Co., W. M., 1600 Beard Ave., Detroit, Mich.
Coffin Mfg. Co., B. F., 30 Court, Newark, N. J.
Cook Plate Co., Edw. N., 70 Ship, Providence, R. I.
Improved Seamless Wire Co., 775 Eddy, Providence, R. I.
Interstate Products Corp., 29 Commercial, Newark, N. J.
Venbur. See Coffin Mfg. Co., B. F.
Wilco. See H. A. Wilson Co.
Wilson Co., H. A., Newark, N. J.

THERMOSTATS

American Thermostat Co., 226 Jelliff Ave., Newark, N. J.
Automatic Appliance Co., Jackson, Mich.
Bak-Rite. See Electric Appliance Mfg. Co.
Bishop & Babcock Sales Co., 4901 Hamilton Ave., N. E., Cleveland, O.
Boston Machine Wks. Co., 7 Willow, Lynn, Mass.
Brown. See Electric Automatic Appliance Co.
Brown Instrument Co., Wayne & Windrim, Philadelphia, Pa.
Burlo Controller Co., 360 Lexington Ave., New York, N. Y.
Cobb Elec. Appliance Co., 100 Massachusetts Ave., Boston.
Cramblett Engineering Div. of Time-O-Stat Controls Co., 286 Milwaukee, Milwaukee, Wis.
Coffin Mfg. Co., B. F., 30 Court, Newark, N. J.
Diamond H. See Hart Mfg. Co.
Electric Automatic Appliance Co., Denver, Colo.
Electric Heat Control Co., 5902 Carnegie Ave., Cleveland, O.
Electric Maid. See Hankscraft Co.
Fabrice Thermostatic Control Co., 4750 Sheridan Rd., Chicago, Ill.
Freas Thermo-Electric Co., 1206 S. Grove, Irvington, N. J.
Globe Mfg. Co., Battle Creek, Mich.
Hankscraft Co., 615 E. Washington, Madison, Wis.
Hart Mfg. Co., Hartford, Conn.
Hi-Lo. See Boston Machine Wks. Co.
Hynes & Cox Elec. Corp., 496 N. Pearl, Albany, N. Y.
Interstate Products Corp., 29 Commercial, Newark, N. J.
King. See Electric Heat Control Co.
Klixon. See Westinghouse Electric & Mfg. Co.
Manhattan Elect. Supply Co., 510 Sixth Ave., New York.
Marvel. See American Thermostat Co.
Mercoid Corp., 564 W. Adams, Chicago, Ill.
Moeller, A. E., 261 Sumpter, Brooklyn, N. Y.
Midget. See Coffin Mfg. Co., B. F.
National Steel Construction Co., 425 Fountenac, Seattle, Wash.
Pyratherm. See Federal Gauge Co.
Safety Regulator Co., 529 S. Mathews, Los Angeles, Cal.
Savutime Devices, Inc., 88 Manhattan, Rochester, N. Y.
Struthers Dunn, Inc., 1135 Race, Philadelphia, Pa.
Standard Thermometer Co., 65 Shirley, Boston 19, Mass.
Tagliabue Mfg. Co., C. J., 18 32rd, Brooklyn, N. Y.
Teeple Co., L. B., 540 E. 9th, Portland, Ore.
Thermolectric. See Bishop & Babcock Sales Co.
Time-O-Stat Controls Co., Elkhart, Ind.
Trent Co., Harold E., 439 N. 12th, Philadelphia, Pa.
Visaflame. See Mercoid Corp.
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.
Wilcolator Co., Newark, N. J.

TIGHTENERS, Commutator

Elmes Engineering Works, Chas. F., 230 N. Morgan, Chicago, Ill.
TIME SWITCHES. See Switches, Time.

TIN FOIL

Lehmaier, Schwartz & Co., 521 W. 25th, New York, N. Y.
United States Foil Co., 30th & Grand Sts., Louisville, Ky.
TINNING TANKS, WIRE. See Wire Manufacturing Machines.
TINSEL. See Wire, Insulated.

TINSEL, Cord and Thread

Belden Mfg. Co., 2310 B S. Western Ave., Chicago, Ill.
Diamond Braiding Mills, Chicago Heights, Chicago, Ill.
Frank & Co., M. J., 15 W. 39th St., New York, N. Y.
Hy-Sil Mfg. Co., Revere, Mass.
Kilo Co., 2 E. 23rd, New York, N. Y.
Koelle, Frederick C., Real Estate Trust Bldg., Philadelphia.
Lees Mfg. Co., 320 Broadway, New York, N. Y.
Montgomery Co., J. R., Windsor Locks, Conn.
Rockbestos Products Corp., Nicoll & Canner, New Haven, Ct.
Springfield Wire & Tinsel Co., Springfield, Mass.
Taft Co., R. C., 174 N. Franklin, Chicago, Ill.

TIPS, Cord

Duro. See McEvoy, C. H.
McEvoy, C. H., 430 Broadway, Lowell, Mass.
National Acme Mfg. Co., 7500 Stanton Ave., Cleveland, O.
Norden & Co., S. 180 S. Water, Providence, R. I.
Rome Wire Co., Div. of General Cable Corp., Rome, N. Y.
Waterbury Brass Goods Corp., Waterbury, Conn.
TOOLS, Commutator Slotting. See Slotting Machines & Tools, Commutator.

TOOLS, Coil Tamping

Ideal Commutator Dresser Co., 1039 Park Ave., Sycamore, Ill.

TOOLS, Commutator Truing

Acme. See Green Equipment Corp.
Allen Elec. & Equipment Co., N. Pitcher St., Kalamazoo Mich.
Binghamton Flexible Shaft Co., Binghamton, N. Y.
Central Mfg. Co., Fairfield, Ia.
Green Equipment Corp., Monadnock Block, Chicago, Ill.
Ideal Commutator Dresser Co., 1039 Park Ave., Sycamore, Ill.
Imperial. See Martindale Elec. Co.
Jordan Bros., 74 Beekman, New York, N. Y.
Martindale Elec. Co., 1262 W. Fourth, Cleveland, Ohio.

TOOLS, Storage Battery

Battery Equipment & Supply Co., 7530 Greenwood Ave., Chicago, Ill. **Burning Racks, Battery Trucks, Plate Pressers, Mallets, Lead Burners and Strainers.**
Battery Parts Co., Inc., Wilkinsburg, Pa. (Leads.)
Battery Tools Co., 29 Willow, Montclair, N. J.
Besco. See Battery Equipment & Supply Co.
Bobbett Elec. Mfg. Co., 811 E. 43rd St., Chicago, Ill. (Knife Heaters.)
Canedy-Otto Mfg. Co., 1816 McGee, Chicago Heights, Ill. (Floor Vises.)
General Elec. Co., Schenectady, N. Y. (Lead Burning Outfits.)
Heet-A-Knife. See Op-al Elec. & Mfg. Co.
Ohio Parts Co., 5301 Colerain Ave., Cincinnati. (Terminals.)
Op-al Elec. & Mfg. Co., 1057 E. 30th St., Indianapolis, Ind. (Knife Heaters.)
Orum, S. R. M., 503 N. 11th, Philadelphia, Pa. (Pillar Post Sleeves, Tongs, Reamers, Strap Punches, Terminal Pullers, Steamers, Racks or Stands, Terminal Post Shapers, Battery Analyzer, Post Sealing Machine, Plate Burning Press, Press and Stands.)
Pyratip. See General Elec. Co.
Reliable Parts Mfg. Co., Wellington, O. (Steamer and Still, Filler, Separator Cutter, Clips, Carrier, Post Cutter, Terminal and Cell Puller.)

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Clayton & Lambert Mfg. Co., Detroit, Mich.
Dreadnaught. See Wall Mfg. Supply Co.
Klein & Sons, Mathias, Chicago, Ill.
McGill Mfg. Co., Valparaiso, Ind.
Staysalite. See Klein & Sons, Mathias.
TORPEDO Cord. See Twine.
TORSION BALANCES. See Instruments, Laboratory Standard

TRANSFORMERS

Radio. See Radio Circuit Components.
Gas Tube Sign. See Transformers, Oil Burner.
Oil Burner Ignition. See Transformers, Low & Intermediate Voltage.

TRANSFORMERS, Low and Intermediate Voltage

For Oil Burners, Gas Tube Signs, and other special purposes.
American Bosch Magneto Corp., Springfield, Mass.
American Transformer Co., Newark, N. J.
Campbell Elec. Mfg. Co., Lynn, Mass.
Chicago-Jefferson Fuse & Elec. Co., 1505 W. 15th, Chicago.
Dongan Elec. Mfg. Co., 2985 Franklin, Detroit, Mich.
General Electric Co. (Merchandise Dept.), Bridgeport, Conn.
K-W Ignition Corp., 2311 Chester Ave., Cleveland, Ohio.
Manhattan Elect. Supply Co., 510 Sixth Ave., New York.
Sorgel Electric Co., 89 W. Water, Milwaukee, Wis.
Standard Transformer Co., Warren, O.
Thordarson Elec. Mfg. Co., Huron & Kingsbury Sts., Chicago, Ill.
Uptigraff Mfg. Co., R. E., First National Bank Bldg., Pittsburgh, Pa.
Ward Leonard Elec. Co., Mt. Vernon, N. Y.
Webster Electric Co., Racine, Wis.
TRANSMISSION DRIVES. See Chain, Transmission.

TRANSMITTERS, Power

Controller drive giving a variety of speeds for use in connection with coil taping machines.
Electric Service Supplies Co., 17th & Cambria Sts., Philadelphia, Pa.
Segur. See Electric Service Supplies Co.
TROUBLE FINDERS. See Instruments, Portable and Switchboard; also Testers, Coil.
TRUCKS, Armature. See Lifts, Armature.

TRUCKS, Factory Steel

Angle Steel Stool Co., Plainwell, Mich.
TRUING Devices, Commutator. See Tools, Commutator.
TUBE (Tubes) (Tubing) **Adapters.** See Radio Receiver Parts.
Brass. See Tubing, Brass.
Condenser. See Tubing, Brass and Copper.
Copper. See Tubing, Brass.
Cutters. See Stocks, Dies, etc.
Fibre. See Fibre.
Fibre Candle. See Candles.
Mica. See Mica.
Paper. See Tubes, Paper.
Platinum. See Platinum.
Pyrometer. See Cores, Resistance.
Refractory. See Cores, Resistance.
Radio. See Radio Vacuum Tubes.
Varnished Fabric. See Tubing, Varnished Fabric.

TUBES, Paper; Cores; Sleeves, Bushings

Cleveland Container Co., 10800 Berea Rd., Cleveland, O.
Climax Tube Co., Mystic, Conn.
Klimaxcore. See Climax Tube Co.
McCausland, J. E., 85 Valley, Providence, R. I.
Pairpoint Corp., New Bedford, Mass.
Reliable Elec. Co., 3145 Carroll Ave., Chicago, Ill.
Remington Mfg. Co., 939 Barnum Ave., Bridgeport, Conn.
Standard Underground Cable Co., Div. of General Cable Corp., Pittsburgh, Pa.
Stone Paper Tube Co., 38 O. N. E., Washington, D. C.
Textile Tube Co., Fall River, Mass. (Paper Sleeves.)

TUBING, Brass and Copper

American Brass Co., Waterbury, Conn.
Anaconda. See American Brass Co.
Baltimore Tube Co., 1301 Wicomico, Baltimore, Md.
Bridgeport Brass Co., Bridgeport, Conn.
Bull Dog. See National Elec. Products Corp.
Chase Brass & Copper Co., Waterbury, Conn.
Conklin Brass & Copper Co., T. E., 54 Lafayette, New York
Cook, Dunbar Smith Co., 85 Sprague, Providence, R. I
Dallas Brass & Copper Co., 820 Orleans, Chicago, Ill.
French Mfg. Co., 128 Robbins, Waterbury, Conn.
Michigan Copper & Brass Co., 5851 W. Jefferson Ave., Detroit, Mich.
Mueller Brass Co., Port Huron, Mich.
National Copper & Smelting Co., 1395 Coltman Rd., Cleveland, O.
National Elec. Products Corp., Pittsburgh, Pa.
Randolph Clowes Co., Waterbury, Conn.
Relleum. See Mueller Brass Co.
Roberts Tube Works, 2500 Military Ave., Detroit, Mich.
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Rome Hollow Wire & Tube Co., Rome, N. Y.
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Summerill Tubing Co., Bridgeport, Pa.
Torrington Mfg. Co., Torrington, Conn.
United Wire & Supply Co., 1497 Elmwood Ave., Providence.
Wells Co., A. H., Watertown Ave., Waterbury, Conn.
Wolverine Tube Co., 1431 Central Ave., Detroit, Mich.

TUBING, Flexible Metallic

(Flexible Tubing.)
Almond Mfg. Co., T. R., Ashburnham, Mass.
American Metal Hose Co., Waterbury, Conn.
American Metal Moulding Co., 146 Colt St., Irvington, N. J.
Anaconda Wire & Cable Co., 25 Broadway, New York, N. Y.
Auto-Brassflex. See National Metal Elec. Products Corp.
Auto-Steelflex. See National Metal Elec. Products Corp.
Hrsene Corp., Inc., 24 S. 6th, Newark, N. J.
Fischer Spring Co., Chas., 238 Kent Ave., Brooklyn, N. Y.
National Elec. Products Corp., 1110 Fulton Bldg., Pittsburgh, Pa.
Riflex. See United Metal Hose Co.
Sleeper & Hartley, Inc., Worcester, Mass.
Time-O-Stat Controls Co., Elkhart, Ind.
Titeflex Metal Hose Co., Newark, N. J.
Triangle Conduit Co., Dry Harbor Rd. and Cooper Ave., Brooklyn, N. Y.
United Metal Hose Co., 724 Garrison Ave., New York, N. Y.
White Dental Mfg. Co., S. S., 152 W. 42nd, New York.

TUBING, Rubber

Rubber Tubing for Insulating Wire in Instruments and Telegraph Signal Lines.
Canfield Rubber Co., 702 Railroad Ave., Bridgeport, Conn.
Eisler Electric Corp., 756 S. 13th, Newark, N. J.
Faultless Rubber Co., Ashland, O.
Forest City Rubber Co., 1276 Ontario, Cleveland, O.
Goodrich Rubber Co., B. F., Akron, O.
Rubber-Vac. See Eisler Electric Corp.
Tyler Rubber Co., Andover, Mass.
Vulcanized Rubber Co., 251 Fourth Ave., New York, N. Y.

TUBING, Varnished Fabric

Insulating Tubing—Spaghetti.
Acme Wire Co., New Haven, Conn.
Alpha Radio Supply Co., 520 Broadway, New York, N. Y.
Bentley-Harris Mfg. Co., Conshohocken, Pa.
Brand & Co., William, 268 Fourth Ave., New York, N. Y.
Empire. See Mica Insulator Co.
General Electric Co., Merchandise Dept., Bridgeport, Conn.
Goodrich Rubber Co., B. F., Akron, O.
Insulated Duct & Cable Co., Stokes, Trenton, N. J.
Insuline Corp. of America, 78 Cortlandt, New York, N. Y.
Irvington Varnish & Insulator Co., Irvington, N. J.
Lee Tire & Rubber Co., Conshohocken, Pa.
Mica Insulator Co., 200 Varick, New York, N. Y.
Mitchell-Rand Mfg. Co., 19 Vesey, New York, N. Y.
Pearce Co., R. T., Covington, Ky. (Insulated Waxed Cotton.)
Turbo. See Brand & Co.
Varflex Corp., Rome, N. Y.
TURNED-UP BOXES AND CABINETS. See Cabinets, Sheet Steel.
TURNING TOOLS, COMMUTATOR. See Tools, Commutator Truing.

TWINE, Armature Winding; Torpedo Cord

Mitchell-Rand Mfg. Co., 19 Vesey, New York, N. Y.
Winne & Son, Frank W., 42 N. Front, Philadelphia, Pa.
UNDERCUTTERS, Mica. See Slotting Machines & Tools, Commutator.
UNITS, Refrigerator Condenser. See Condenser Units, Refrigerator

UNITS, Rods and Grids, Resistance

Acme Elec. Heating Co., Dept. R, 1217 Washington, Boston.
Allen-Bradley Co., 494 Reed, Milwaukee, Wis.
Automatic Electric Heater Co., 1706 Race, Philadelphia, Pa.
Bradleyunit. See Allen Bradley Co.
Buffalo Products Co., Broome & Lafayette Sts., New York.
Burger, J. P., 1813 Columbus Rd., Cleveland, O.
Calred. See Edison Elec. Appliance Co.
Chromalox. See Edwin L. Wiegand Co.
Clark Controller Co., 1146 E. 152nd, Cleveland, O.
Crown Coloring & Chemical Co., 33 W. 17th, New York.
Cutler-Hammer, Inc., 1288 St. Paul Ave., Milwaukee.
Dalton Elec. Heating Co., 287 Bridge St., Salem, Mass.
Dalton-Marsh Co., 88 Holten, Danvers, Mass.
Darle Co., 35 E. 21st, New York, N. Y.
Di-El-Ite. See Wirt Co.
Dixon Crucible Co., Jos., Jersey City, N. J.
Dur-ristor. See Cutler-Hammer, Inc.
Eagle Elec. Mfg. Co., 79 Hall, Brooklyn, N. Y.
Edgerest. See Industrial Controller Div.
Edgewound. See Monitor Controller Co.
Edison Electric Appliance Co., 5618 W. Taylor, Chicago, Ill.
Elec. Controller & Mfg. Co., 2700 E. 79th, Cleveland, O.
Electro Thermal-Unit Co., 44 N. Fourth, Philadelphia, Pa.
Elemite. See Louthan Mfg. Co.
Erie Resistor Corp., 644 W. Twelfth, Erie, Pa.
Fits-All. See Eagle Elec. Mfg. Co.
Fitz-All. See Rodale Mfg. Co.
Fitz-Rite. See Rodale Mfg. Co.
Fix-All. See Willow Elec. Mfg. Co.
F & M. See Hiram Marks Elec. Co.
General Electric Co., Schenectady, N. Y.
Globar Corp., Niagara Falls, N. Y.
Glo-Well. See Eagle Elec. Mfg. Co.
Gold Seal Elecl. Co. of Ohio, Inc., 250 Park Ave., New York, N. Y.
Hance-Parker Mfg. Co., 397 West Main, Meriden, Conn.
Hankscraft Co., 615 E. Washington, Madison, Wis. (Oven Heater Unit.)
Hardwick, Hindle, Inc., 122 Greenwich, New York, N. Y.
Hexwound. See Monitor Controller Co.
Industrial Controller Div. of Square D Co., S. Pierce & Hanover Sts., Milwaukee, Wis.
Industrial Heater Co., 300 Canal, New York, N. Y.
International Resistance Co., 2006 Chestnut, Philadelphia, Pa. (Radio Resistance.)
Kricheer's Mfg. Co., 255 Calyer, Brooklyn.
Louthan Mfg. Co., East Liverpool, O.
Marks, Elec. Co., Hiram, 304 Woodward Ave., Detroit, Mich.
Monitor Edgewound. See Clark Controller Co.
Monitor Controller Co., 51 S. Gay, Baltimore, Md.
Nelco. See Nelson Electric Co.
Nelson Electric Co., Plant City, Fla.
Northern Electric Co., 2832 N. Western Ave., Chicago, Ill.
Ogden Mfg. Co., 2947 Armitage Ave., Chicago, Ill.
Ohmite Mfg. Co., 636 N. Albany Ave., Chicago, Ill.
Ohm-Spun. See States Co.
Op-al Elec. & Mfg. Co., 1057 W. 30th, Indianapolis, Ind.
Parker & Co., J. C., 407 Bulletin Bldg., Philadelphia, Pa.
Poloron Elec. Mfg. Co., 20 Bond, New York, N. Y.
Presto Products Co., 64 University Place, New York, N. Y.
Prometheus Elec. Corp., 358 W. 13th, New York, N. Y.
Pyrox. See Westinghouse Elec. & Mfg. Co.
Reben Elec. Mfg. Co., 2024 Gravesend Ave., Brooklyn, N. Y.
Remco. See Reben Elec. Mfg. Co.
Renuall. See Ogden Mfg. Co.
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Ward Leonard Elec. Co., 31 South, Mt. Vernon, N. Y.
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Tagliabue Mfg. Co., C. J., 18-83rd St., Brooklyn, N. Y.
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Time-O-Stat Controls Co., Elkhart, Ind.
Victor. See Lunkenheimer Co.
Zeco. See Zisch Engineering Corp.
Zisch Engineering Corp., 39 Avenue L, Newark, N. J. (Gas.)
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VARNISHED TAPE. See Tape, Varnished Fabric.
VARNISHED TUBING. See Tubing, Varnished Fabric.
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VOLTMETERS. See Instruments.
VULCANITE. See Rubber, Hard.

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National Lock Washer Co., Newark, N. J.
Positive Lock Washer Co., Ave. A & Miller, Newark, N. J
Shakeproof Lockwasher Co., 2513 N. Keeler Ave., Chicago
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Chicago Nut Mfg. Co., 2513 Cullerton, Chicago, Ill.
Hubbard Spring Co., M. D., Pontiac, Mich.
Massachusetts Machine Shop, Inc., Boston, Mass.
New England Screw Co., Dept. A., 44 Farnsworth, Boston
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Biwax Corp., 208 S. La Salle, Chicago, Ill.... W S . .
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Bulls-Eye. See Zinsser & Co.
Cablelene. See Vacuum Oil Co.
Candy & Co., 35th and Maplewood Ave., Chicago W S . .
Cerowax. See Vacuum Oil Co.
Clifton Mfg. Co., 65 Brookside Ave., Boston. C
Cochrane Chemical Co., 432 Danforth Ave., Jersey City, N. J. . . . W S . .
Dolph Co., John C., 168 Emmet, Newark, N. J. W . . .
Di Electric Puttie. See Ackurate Rubber Co.
Ever-Protect. See National Cable Compound Co.
Flake White. See Williams Co., F. M.
General Electric Co., Merchandise Dept., Bridgeport, Conn. . . . W . . .
Geoge Co., P. A., 4153 Bingham Ave., St. Louis. W . . .
Globe Chemical Co., Murray Road & Big 4 R. R. St. Bernard, Cincinnati, O. . . . W S . .
Goldo Brown See Williams Co., F. M.
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Hercules Powder Co., 975 Market, Wilmington, Del.
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Imco. See Great Lakes Thread & Yarn Co.
India Red Seal. See Williams Co., F. M.
Insulatine Co., 1 Broadway, New York. . . . . W . . .
Insulation. See Vacuum Oil Co.
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Leverite. See Mitchell-Rand Mfg. Co.
Lime Seal. See Mitchell-Rand Mfg. Co.
McGill Mfg. Co., Valparaiso, Ind. C
Minerallac Elec. Co., 1045 Washington Blvd., Chicago, Ill. . . . W . . .
Mitchell-Rand Mfg. Co., 19 Vesey, New York. . . . W S C
Mule-Hide. See Lehon Co.
National Cable Compound Co., Mitchell, Ind. . . . W . . .
National Wax Co., 189 W. Madison, Chicago, Ill. . . S . .
Nu-Blac. See Star Porcelain Co.
Par Flexo. See Williams Co., F. M.
Rubberseal. See Mitchell-Rand Mfg. Co.
Rub-Flexo. See Williams Co., F. M.
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Sherwin-Williams Co., Cleveland, O. . . . W . . C
Standard Varnish Wks., 433 4th Av., New York.. W . . .
Standard Wax & Import Co., 110 E. 42nd, New York, N. Y. . . . W S . .
Star Porcelain Co., Trenton, N. J. . . . W . . C
Tacrite. See Seidner & Enequist, Inc.
Tar Products Corp., Indiana Trust Bldg., Providence, R. I.
Trotter & Co., E. T., 574 Johnson Ave., Brooklyn, N. Y. . . . W S
Vacuum Oil Co., 61 Broadway, New York, N. Y. W . . .
Warner-Quinlan Co., 2 Park Ave., New York, N. Y. . . . C
Waverly Oil Wks., 54th and A. V. R. R., Pittsburgh, Pa. . . . S . .
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WEDGE DRIVERS. See Tools, Cummutator.
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Almanc. See Allan Mfg. & Welding Co., Inc.
Alternarc. See Electric Arc Cutting & Welding Co.
American Elec. Fusion Corp., 2610 Diversey Ave., Chicago
Ames Co., 115 Ninth, Brooklyn, N. Y.
Burke Electric Co., Erie, Pa.
Cushing Mfg. Co., 5617 Pacific Blvd., Los Angeles, Cal.
Dwyer Machine Co., Lynn, Mass.
Economy Electric Products Co., 2400 Woodland Ave., Cleveland, O.
Eisler Electric Corp., 756 S. 13th, Newark, N. J.
Electric Arc Cutting & Welding Co., 156 Jelliff Ave., Newark, N. J.
Electric Welding Co. of America, 744 Court, Brooklyn, N. Y
Electric Welding Machine Co., 1530 Larned, E., Detroit.
Farwest Electric Welder Co., 1107 Northlake Ave., Seattle.
Federal Machine & Welder Co., Dana Ave., Warren, O.
Fleet-Weld. See Lincoln Elec. Co.
Fusion Welding Corp., 10257 Torrence Ave., Chicago
General Electric Co., Schenectady, N. Y.
General Engrg. & Supply Co., 160 5th Ave., New York, N. Y
Gibb Welding Machines Co., Bay City, Mich.
Hansen. See Northwestern Mfg. Co.
Hollup Corp., C. H., 3333 W. 48th Place, Chicago, Ill.
Lincoln Electric Co., Coit Rd. and Kirby Ave., Cleveland
Lundy Co., E. A., Fulton Bldg., Pittsburgh, Pa.
Meadams Co., J. C., New Britain, Conn.
Nigg Engineering Corp., Second St. & Covina Blvd., Covina, Cal.
Northwestern Mfg. Co., 480 Clinton, Milwaukee, Wis.
Owen Elec. Mfg. Co., Fayetteville, N. C.
Plastic Arc. See Wilson Welder & Metal Co.
Pyrotip. See General Elec. Co.
Quasi-Arc., Inc., 11 W. 42nd St., New York, N. Y.
Ryerson & Son, Jos. T., 2558 W. 16th, Chicago, Ill.
Sellars Arc Welder Co., 1200 Fourth Ave., Seattle, Wash.
Seneca Electric Welder Corp., 5057 Woodward, Detroit, Mich
Siemund Wenzel Electric Welding Co., 79 Hancock, Long Island City, N. Y.
Swift Elec. Welder Co., 2567 W. Grand Blvd., Detroit.
Taylor-Winfield Corp., Mahoning Ave., Warren, O.
Thompson Electric Welding Co., Lynn, Mass.
Una Welding & Bonding Co., 1615 Collamer Ave., Cleveland, O.
U. S. L. Battery Corp., Niagara Falls, N. Y.
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.
Wilson Welder & Metal Co., Hoboken factory, Terminal Bldg., Hoboken, N. J.
Zeus. See Gibb Welding Machine Co.
WHEATSTONE BRIDGES. See Instruments, Laboratory Standard.

WICKS, Lubricating

Brawley, T. R., 279 20th, Brooklyn, N. Y.

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Armature & Field Coil. See Winding Machines, Armature & Field Coil.
Coil. See Winding Machines, Armature & Field Coil.
Electromagnet. See Winding Machines, Induction Coil.
Filament. See Machines, Lamp Making.
Induction Coil. See Winding Machines, Induction Coil.
Loop. See Winding Machines, Armature & Field Coil.

WINDING MACHINES, Armature and Field Coil

Armature Coil Equipment Co., 2415 Forestdale Ave., Cleveland, Ohio.
Browning. See Mutual Foundry & Machine Co.
Chapman Electric Works, F. E., 1820 Chouteau Ave., St. Louis, Mo.
Columbia Machine Works & Malleable Iron Co., Atlantic Ave. & Chestnut St., Brooklyn, N. Y.
Comstock Mfg. Co., Wilkes-Barre, Pa.
Conran, Frederick M., 107 Colden, Newark, N. J.
Electric Service Supplies Co., 17th & Cambria Sts., Philadelphia, Pa.
Handy. See Armature Coil Equipment Co., 2415 Forestdale Ave., Cleveland, Ohio.
Herald Electric Co., 29 East End Ave., New York, N. Y.
Hunsdorf, Wm., 2056 E. Fourth, Cleveland, O.
Liberty Starter Co., 271 Vinewood Ave., Detroit, Mich.
Line, W. C., 208 S. Geddes, Syracuse, N. Y.
Mutual Foundry & Machine Co., Atlanta, Ga.
Onan, David W., 43 Royalstone Ave., Minneapolis, Minn.
Peerless. See Electric Service Supplies Co.
Ridion Co., Frank, 253 A St., Boston, Mass.
Segur. See Electric Service Supplies Co.
Superior. See Armature Coil Equipment Co.

WINDING MACHINES, Induction Coil

Belden Mfg. Co., 2310B S. Western Ave., Chicago, Ill.
Conran, Frederick M., 107 Colden, Newark, N. J.
Eureka Tool & Machine Co., 42 Walnut, Newark, N. J.
Leesona. See Universal Winding Co.
Lipe, W. C., 208 S. Geddes, Syracuse, N. Y.
Morris Register Co., 29th & Broadway, Council Bluffs, Iowa.
Radio Production Machinery Co., 212 Centre, New York.
Universal Winding Co., Boston, Mass.
Viking Tool & Machine Co., 747 65th, Brooklyn, N. Y.
Weehawken Engineering Co., 543 Gregory Ave., Weehawken, N. J.
WINDINGS. See Coils, Finished.

WINDOW SHADES, Factory

Athey Co., 6142 West 65th St., Chicago, Ill.
WIRE (Cable) (Cord), Aluminum. See Aluminum.
Copper Clad. See Wire, Copper Clad.
Forms. See Forms, Wire.
Frames. See Forms, Wire.
Fuse. See Fuses and Fuse Wire.
Lamp & Tube Filament. See Filaments, Incandescent Lamp.
Molybdenum. See Molybdenum.
Phosphor Bronze. See Phosphor Bronze.
Platinum. See Platinum.
Radio Bus. See Wire, Bare.
Scrapers. See Strippers.
Strippers. See Strippers.
Tungsten. See Filament, Incandescent Lamp.

WIRE, Bare

Armature Banding .....See S
Copper Wire .....See C
Iron Wire .....See S
Phosphor Bronze .....See B
Radio Bus Wire .....See C
Resistance Wire .....See R
Steel Wire .....See S

Acme. See Alloy Metal Wire Co.
Advance. See Driver Harris Wire Co.
Alloy Metal Wire Co., Moore, Pa. . . . C R . .
American Copper Products Corp., 233 Broadway, New York, N. Y. . . . C R . .
American Electrical Works (Phillipsdale), Providence, R. I. . . . C . . .
American Insulated Wire & Cable Co., Div. of General Cable Corp., 954 W. 21st, Chicago. . . . C . . S
American Steel & Wire Co., 208 S La Salle.
Anaconda Wire & Cable Co., 25 Broadway, New York, N. Y. . . . C . . .
Anylite Elec. Co., Fort Wayne, Ind. . . . C . . .
Ballast. See Gilby Wire Co.
Baltimore Copper Mills (Div. of General Cable Corp.), Baltimore, Md. . . . C . . .
Bassett Metal Goods Co., Derby, Conn. (General Sales Agent, Hatheway & Co., 16 Hudson, New York, N. Y. . . . C . . .
Belden Mfg. Co., 2310B S. Western Ave., Chicago C . . S
Beldenite. See Belden Mfg. Co.
Bradford, Kyle & Co., Plymouth, Mass. . . . R . .
Braidite. See Cornish Wire Co.
Brenvar. See American Insulated Wire & Cable Co.
Bridgeport Brass Co., Bridgeport, Conn. . . . C . . .
Calido. See Driver Harris Wire Co.
Chromel. See Hoskins Mfg. Co.
Chromic. See Murray-Harris Wire Co.
Climax. See Driver Harris Wire Co.
Comet. See Driver Harris Wire Co.
Comin. See Gilby Wire Co.
Cook Plate Co., Edw. N., 70 Ship, Providence, R. I. C . . .
Copel. See Hoskins Mfg. Co.
Copperweld Steel Co., Glassport, Pa. . . . C . . S
Cornish Wire Co., 30 Church, New York, N. Y.. C . . .
Corwica. See Cornish Wire Co.
Crape. See Indiana Steel & Wire Co.
Crescent Ins. Wire & Cable Co., Trenton, N. J.. C . . .
Cupron. See Gilby Wire Co.
Darow Mfg. Co., 36 E. 20th, New York, N. Y... C . . .
Detroit Insulated Wire Co., Detroit, Mich..... C . . .
1885. See Chicago Insulated Wire & Mfg. Co.

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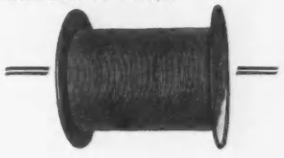

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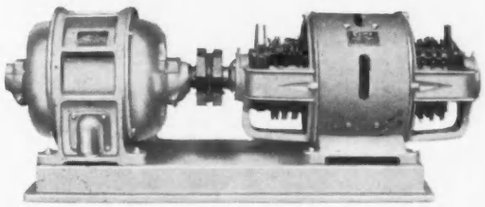

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Driver Harris Wire Co., Harrison, N. J. ..... B
Electron. See Bassett Metal Goods Co.
Excelicier. See Branford Elec. Co.
Fullman Mfg. Co., 1309 Jefferson, Latrobe, Pa. ..... .
Gilby Wire Co., Riverside Ave., Newark, N. J. ..... B
Goldmark Co., James, 83 Warren, New York.. C ..... .
Hope Webbing Co., Providence, R. I. (Braided Wire Tape) ..... C ..... .
Hoskins Mfg. Co., 4415 Lawton Ave., Detroit, Mich. ..... B ..
Hudson Wire Co., Ossining, N. Y. ..... C M ..
Ideal. See Driver Harris Wire Co.
Indiana Rubber & Insulated Wire Co., Jonesboro, Ind. ..... C .. S
Indiana Steel & Wire Co., Muncie, Ind. .... S
Karma. See Driver Harris Wire Co.
Keystone. See Fullman Mfg. Co.
Lucero. See Driver Harris Wire Co.
Marion Insulated Wire & Rubber Co., Marion, Ind. C ..... .
Monex. See Standard Alloy Wire Co.
National-Harris Wire Co., 195 Verona Ave., Newark, N. J. ..... B ..
Nehring Electrical Works, De Kalb, Ill. ..... C ..... .
Nichrome. See Driver Harris Wire Co.
Novar. See Standard Alloy Wire Co.
Page Steel & Wire Co., Bridgeport, Conn. ..... S
Paranite. See Indiana Rubber & Insulated Wire Co.
Peerless. See Alloy Metal Wire Co.
Phillips Wire Co., Div. of General Cable Corp., Pawtucket, R. I. ..... C ..... .
Phono-Electric. See Bridgeport Brass Co.
Premier. See Alloy Metal Wire Co.
Providence Insulated Wire Co., Providence, R. I.. C ..... .
Race. See Roma Wire Co.
Revolute Wire Co., Hastings-on-Hudson, N. Y.... C ..... .
Rice Co., A. H., Pittsfield, Mass. ..... C ..... .
Roebling's Sons Co., John A., Trenton, N. J..... C .. S
Rome Wire Co., Div. of General Cable Co., Rome, N. Y. ..... C ..... .
Ross Wire Co., 69 Bath, Providence, R. I.. ..... C ..... .
Seneca Wire & Mfg. Co., Fostoria, O. .... S
Silcrimp. See Valley Narrow Fabric Co.
Silectron. See Standard Alloy Wire Co.
Solar. See Gilby Wire Co.
Sparg Wire Co., J. A., Rome, N. Y. ..... C ..... .
Standard Alloy Wire Co., Elizabeth, N. J. .... R S
Standard Underground Cable Co. (Div. of General Cable Corp.), Pittsburgh, Pa. ..... C ..... .
Super-Insulated Wire Co., Plymouth, Mass. ..... C ..... .
Superior. See Alloy Metal Wire Co.
Talking Tape. See Hope Webbing Co.
Therlo. See Driver Harris Wire Co.
Tophet. See Gilby Wire Co.
Tru-Lay. See Page Steel & Wire Co.
Valley Narrow Fabric Co., Falls, R. I.
Wheeler Insulated Wire Co., Bridgeport, Conn.. C ..... .

WIRE, Copper Clad

Copperweld Steel Co., Rankin, Pa.
Standard Underground Cable Co., Div. of General Cable Corp., Pittsburgh, Pa.

WIRE SOLDER. See Solder, Bar and Wire.

WIRE DRAWING MACHINES

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American Insulating Machinery Co., 519 Huntington Ave., Philadelphia, Pa.
Sleeper-Hartley, Inc., Worcester, Mass.
Torrington Manufacturing Co., 70 Franklin, Torrington, Conn.
Vaughn Machinery Co., Cuyahoga Falls, Ohio.
Wire Machinery Corp. of Am.. New Haven, Conn..

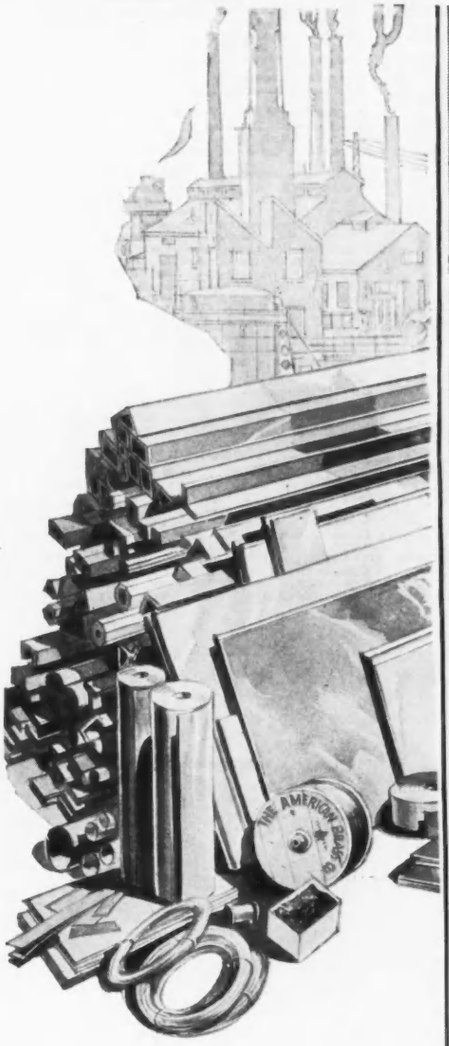
WIRE, Insulated

KEY

Annunciator, Office, Bell Wire....See A
Asbestos Covered Heater Cord.....See H
Asbestos Covered Magnet Wire....See M
Enameled Magnet Wire .....See M
Fixture Wire .....See R
Flexible Reinforced Heavy Duty Cord .....See F
Heater Cord .....See H
Ignition Cable .....See R
Lamp Cord .....See R
Magnet Wire .....See M
Rubber Covered Wire & Cable..See R
Stove Wire .....See H
Telephone Cord .....See T

A-A Wire Co. (Div. of General Cable Corp), 420 Lexington Ave., N. Y. C.. R ..... .
A-1 Brand. See American Insulated.
Acme Wire Co., New Haven, Conn. Enamaled Silk, Cotton ..... M
Amelectric. See American Elec.
American Braiding Co., Holyoke, Mass. R ..... .
American Brand. See American Insulated Wire & Cable Co.
American Copper Products Corp., 233 Broadway, New York, N. Y. ..... .
American Electrical Works (Philipsdale), Providence, R. I. ..... M
American Enameled Magnet Wire Co., Muskegon, Mich. ..... M
American Insulated Wire & Cable Co. Div. of General Cable Co., 954 W. 21st, Chicago, Ill. ..... M
American Insulated Wire Corp., Div. of General Cable Co., 45 Baker, Providence, R. I. ..... R F .. A T ..
American Steel & Wire Co., 208 S. La Salle, Chicago, Ill. ..... R F H A T M
Americore. See American Steel.
Amerite. See American Steel.
Amerixe. See American Steel.
Amparak. See American Steel.
Anaconda Wire & Cable Co., 25 Broadway, New York, N. Y. ..... R W .. A .. M
Anaconda Wire & Cable Co., Pawtucket, R. I. ..... R F ..... .
Anaconda Wire & Cable Co., Maring Wire Branch, Muskegon, Mich. (Silk, Enamel) ..... M
Ansonia Electrical Co., Ansonia, Conn. Silk, Cotton, Enameled ..... A .. M
Armoriokt. See American Steel.
Bay State Insulated Wire & Cable Co., Paydras (Mattapan), 26, Boston..... R ..... .
Chicago, Ill. ..... R F H A T M
Belden Mfg. Co., 2310B S. Western Ave.,
Beldenamel. See Belden Mfg. Co.
Beldenite. See Belden Mfg. Co.
Bishop Wire & Cable Corp., 420 E. 25th, New York, N. Y. ..... R F ..... .
Boston Insulated Wire & Cable Co., 65 Bay, Boston, Mass. ..... R F H ..... .

Bradford, Kyle & Co., Plymouth, Mass. ..... M
Cablex. See Collyer Insulated Wire Co.
Celatsite. See Acme Wire Co.
Collyer Insulated Wire Co., Pawtucket, R. I. ..... R F H ..... .
Colorbeston. See General Elec. Co.
Condex. See Simplex Wire Co.
Colorubber. See Belden Mfg. Co.
Copperweld Steel Co., Rankin, Pa..... R ..... T ..
Cotenamel. See Belden Mfg. Co.
Cottonite. See Acme Wire Co.
Crescent Ins. Wire & Cable Co., Trenton, N. J. ..... R F H A T M
Darow Mfg. Co., 36 E. 20th, New York. R ..... .
Davis-Jones Insulated Wire Co., Pawtucket, R. I. ..... R F H A T ..
Deltabeston. See York Insulated.
Detroit Insulated Wire Co., Detroit, Mich. R ..... T ..
Diamond Braiding Mills, Chicago Heights R F H ... M
Di-Noburn. See Diamond Braiding Mill.
Dreadnaught. See Indiana Rubber Co.
Driver-Harris Co., Harrison, N. J..... R .. H ..... .
Dudlo Mfg. Co., Div. of General Cable Corp., Fort Wayne, Ind.. ..... M
Ducatto. See Dudlo Mfg. Co.
Durabilt. See Anaconda Wire & Cable Co.
Duracord. See Anaconda Wire & Cable Co.
Durawire. See Anaconda Wire & Cable Co.
Duro. See McEvoy, C. H.
Eagle. See Goldmark Co., James.
Eastern Insulated Wire Co., Tilton, N. H. B ..... .
1885. See Chicago Insulated Wire.
Enamelite. See Acme Wire Co.
Enterite. See Rome Wire Co.
Fibrex. See Simplex Wire Co.
Flexible Woven Cable Co., 755 Boylston, Boston, Mass. ..... F ..... .
Flex-O-Cord. See Packard Elec. Co.
Garco. See General Asbestos Co.
Gavitt Mfg. Co., West Brookfield, Mass. ..... T ..
GE-Flex. See General Elec. Co.
General Asbestos & Rubber Co., Charleston, S. C. ..... H ..... .
General Elec. Co., Merchandise Dept., Bridgeport, Conn.... R F H .... M
Giant. See Collyer Insulated Wire.
Goldmark Co., James, 83 Warren, New York, Annunciator and Asbestos, Cotton, Silk and Enameled Magnet ..... A .. M
Goodyear Rubber Insulating. See Graybar Electric Co.
Graybar Elec. Co., Graybar Bldg., Lexington Ave. & 43rd St., New York, N. Y. R ..... T ..
Grimshaw. See New York Ins.
Hatex. See Hatfield Rubber Wks.
Hatfield Rubber Wks., Inc., Hillside, N. J. ..... R F H .. T ..
Hazacord. See Hazard Insulated Wire Works.
Hazard Insulated Wire Works, Div. of Okonite Co., Wilkes-Barre, Pa.... R F .. A .. M
Holyoke Co., 621 Broadway, New York.. R .... A .. M
Inca Mfg. Co., Fort Wayne, Ind. ..... M
Indiana Rubber & Insulated Wire Co., Jonesboro, Ind. ..... R F H ..... .
I. X. L. See Collyer Insulated.
Kable. See Safety Cable Co.
Kenrite. See American Insulated.
Kerite Ins. Wire Cable Co., 30 Church, New York, N. Y. ..... R ..... .
Kilo. Co., 2 E. 23d, New York... ..... T M
Koelle, Frederick C., Real Estate Trust Bldg., Philadelphia, Pa. ..... T ..
Lowell Insulated Wire Co., Lowell, Mass. R F H ..... .
Liberty. See Nat. Metal Molding
Loxsteel. See Hazard Insulated Wire Works.
McEvoy, C. H., Lowell, Mass..... R ..... T ..
Marion Insulated Wire & Rubber Co., Marion, Ind. ..... R F H A T ..
Massachusetts Elec. Mfg. Co., West Lynn, Mass. ..... M
Montgomery Co., J. R., Windsor Locks, Conn. ..... T ..
National Elec. Products Corp., Pittsburgh, Pa. ..... R F H A T M
N. E. See Goldmark Co., James.
New York Insulated Wire Co., 114 Liberty, New York, N. Y. ..... R ..... .
Nitro. See Belden Mfg. Co.
O. K. See Phillips Wire Co. Also
Okocord. See Okonite Co.
Okonite Co., Passaic, N. J. ..... R ..... .
Ozex. See Simplex Insulated Wire
Packard Electric Co., Warren, O..... R F ..... .
Parac. See Phillips Wire Co.
Paracore. See U. S. Rubber Co.
Parafiex. See Bishop Wire & Cable.
Paranite. See Indiana Rubber.
Parkerite. See Seward Wire Co.
Peco. See Packard Elec. Co.
Philadelphia Insulated Wire Co., 200 N. Third, Philadelphia, Pa. ..... H A T ..
Phillips Wire Co., Div. of General Cable Corp., Pawtucket, R. I. ..... R ..... .
Providence Insulated Wire Co., Providence R F H A ....
Raven Core. See New York.
Reliance. See American Steel.
Rockbestos Products Corp., Nicoll & Conner Sts., New Haven, Conn ..... R .. H .. T M
Roebling's Sons Co., John A., Trenton, N. J. ..... R F H A T M
Rome Electrical Co., Inc., Div. of General Cable Corp., Rome, N. Y. ..... M
Rome Wire Co., Div. of General Cable Corp., Rome, N. Y. ..... R F H .. T M
Ross Wire Co., 69 Bath, Providence, R. I.. R ..... .
Romoxide. See Rome Wire Co.
Ruffcoat. See Rome Wire Co.
Runzel-Lenz Elec Mfg. Co., 1751 N. Western Ave., Chicago, Ill. ..... T ..
Safety Cable Co. (Div. of General Cable Corp.), New York ..... R F H ..... .
Salamander. See York Insulated.
Seward Wire Co., Parkersburg, W. Va. R ..... .
Silkenamel. See Belden Mfg. Co.
Silkenite. See Acme Wire Co.
Simcore. See Simplex Wire.
Simplex Wire & Cable Co., 63 Sydney, Cambridge, Mass. ..... R F ..... .
Shield. See Ansonia Elec'l Co.
Southern States Cable Co., Div. of General Cable Corp., Mobile, Ala. ..... M
Spiralweave. See Hazard Ins. Wire
Standard Alloy Wire Co., Elizabeth, N. J. .... H ..... .
Standard Underground Cable Co., Pittsburgh, Pa. (Div. of General Cable.) R F H A T ..
Sterling. See Standard Underground.
Sterling Insulated Wire Co., Fall River, Mass. ..... R ..... .
Strand & Sweet Mfg. Co., Winsted, Conn. ..... M
Super-Service. See Rome Wire Co.



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Tirex. See Simplex Wire & Cable.
Trenchlay. See Rome Wire Co.
Triangle Conduit Co., Dry Harbor Rd. & Cooper Ave., Brooklyn..... R . . . . . .
Tubular Woven Fabric Co., Pawtucket, R. I. ..... R F . . . . . .
United States Rubber Co., 1790 Broadway New York, N. Y..... R . . H A T .
U. S. Royal. See United States.
Varflex Corp., Rome, N. Y. .... M
Warrior. See American Copper.
Wheeler Insulated Wire Co., Bridgeport, Conn. ..... R F H A T M
White, J. M., 1128 Oliver, Philadelphia, Pa. ..... R F H . . T . .
Whitney Blake Co. See Graybar Electric Co.
Wovenite. See Flexible Woven.
York Insulated Wire Wks. of G. E. Co., 120 Broadway, New York, N. Y..... R . . H . . . M

WIRE MANUFACTURING MACHINES

(See Also Wire Drawing Machines; Insulation Mixers; Taping Machines, Wire; Wire Polishing Machines; Enameling Machines for Magnet Wire; Wire Wrapping Machines; Vulcanizers, Wire Insulation.)

Armoring Machines ..... See A
Braiding Machines ..... See B
Bunching Machines ..... See S
Covering Machines ..... See I
Insulating Machines ..... See I
Insulation Straining Machines..... See I
Measuring Machines ..... See M
Park Cabling Machines..... See A
Saturating Tanks ..... See F
Spooling Machines ..... See U
Stranding Machines ..... See S
Tinning Tanks ..... See F
Winding Reels ..... See U

Adamson Machine Co., Akron, Ohio.. I A . . . . . .
Aimco-Seward. See American Insulating Machinery Co.
American Insulating Machinery Co., 519 Huntington Ave., Philadelphia, Pa. I A . . . . S U F
Breguet. See American Insulating
Crescent. See Royle & Sons, John.
Durant Mfg. Co., 662 Buffum, Milwaukee, Wis. .... M . . U . .

Housatonic Machine & Tool Co., Bridgeport, Conn. ..... I . . . . . U . .
Minneapolis Elec. & Construction Co., 80 S. 12th St., Minneapolis, Minn. . . . . M . . U . .
Nebuttco. See New England Butt Co.
New England Butt Co., 334 Pearl, Providence, R. I. ..... I A B M S U . .
Peerless. See Royle & Sons, John.
Royle & Sons, John, Paterson, N. J. I . . . . . .
Sleeper & Hartley, Inc., Worcester, Mass. .... A . . . . S U
Terkelson Machine Co., 326 A St., Boston, Mass. .... M . . . . .
Textile Machine Works, Reading, Pa. . . . . B . . . . . .
Universal Wire Machy. Co., 69 Daggett, New Haven, Conn..... . . A . . . . . U F
Utility Mfg. Co., Cudahy, Wis..... I . . . . . .
Wardwell Braiding Machine Co., Central Falls, R. I. .... B . . . . . .
Wire Machinery Corp. of Am., New Haven, Conn. .... M S U . .
Weir. See Housatonic Machine

WIRE POLISHING MACHINES

(See Also Wire Manufacturing Machines).
American Insulating Machinery Co., 519 Huntington Ave. Philadelphia, Pa.
New England Butt Co., 334 Pearl, Providence, R. I.

WIRE, Steel Flat

Steel Coating for Armored Conductor.
American Steel & Wire Co., 208 S. La Salle, Chicago, Ill.
Crescent Insulated Wire & Cable Co., 319 N. Oden Ave., Trenton, N. J.
Roebling's Sons Co., John A., Trenton, N. J.
Seneca Wire & Mfg. Co., Fostoria, O.

WIRE STRAIGHTENING MACHINES

Kane & Roach, Syracuse, N. Y.
Shuster Co., F. B., New Haven, Conn.
WIRE TAPING MACHINES. See Taping Machines, Wire
WIRE VULCANIZING MACHINES. See Vulcanizers Wire Insulation.

WIRE WRAPPING MACHINES

Terselson Machine Co., 326 A St., Boston, Mass

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Boxes. See Cabinets & Boxes, Wood
Cabinets. See Cabinets & Boxes, Wood

Pulleys. See Pulleys, Composition.
Woods Metal. See Radio Mountings.
WRAPPERS, Paper. See Boxes and Wrappers.
WRAPPERS, Tungsten Lamp. See Boxes and Wrappers
WRAPPING MACHINES, WIRE. See Wire Wrapping Machines.
American Asbestos Co., Norristown, Pa.
American Glanzstopf Corp., 180 Madison Ave., New York, N. Y.
Anchor Thread Co., Trenton (Grovesville), N. J
Asbestos Fibre Spinning Co., North Wales, Pa.
Columbian Rope Co., Auburn, N. Y.
Commercial Rayon & Thread Co., 19 W. 21st, New York, N. Y.
Ferodo & Asbestos, Inc., New Brunswick, N. J.
Florsheim, H. A., 225 Fifth Ave., New York, N. Y.
Franklin Rayon Corp., 86 Crary, Providence, R. I.
General Electric Co., Schenectady, N. Y.
Great Lakes Yarn & Thread Co., Div. of General Cable Corp., 5133 Wesson Ave., Detroit, Mich.
Johns-Manville Corp., New York, N. Y. (Asbestos.)
Keasbey & Mattison, Ambler, Pa.
Lees Mfg. Co., 320 Broadway, New York, N. Y.
Multiple Winding Co., 77 Summer, Boston, Mass.
Rich & Co., H. S., 180 S. Water, Providence, R. I.
Ryle & Co., Wm., 381 Fourth Ave., New York, N. Y.
Silkslip. See Worcester Bleach & Dye Wks. Co.
Smith & Dove Mfg. Co., Andover, Mass. (Linen Thread.)
Worcester Bleach & Dye Wks., Worcester, Mass.

ZINC

Horse Head. See New Jersey Zinc Co.
New Jersey Zinc Co., 160 Front, New York, N. Y.
Platt Bros. & Co., Waterbury, Conn. (Strips.)
United Metals Selling Co., 25 Broadway, New York, N. Y.

ZINCS AND COPPERS, Battery

Bunker Hill. See St. Joseph Lead Co.
Bunnell & Co., J. H., 32 Park Pl., New York, N. Y.
Edes Mfg. Co., Plymouth, Mass.
Extruded Metal Corp., 184 53rd, Brooklyn, N.Y. (Zinc Cups.)
Franklin. See Grasselli Chemical Co.
Grasselli Chemical Co., Guardian Bldg., Cleveland, O.
Illinois Zinc Co., Peru, Ill.
Lind Mfg. Co. 70 Wyckoff Ave., Brooklyn, N.Y. (Zinc Cups.)
Matthiessen & Hegeler Zinc Co., La Salle, Ill.
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Electrical Manufacturing

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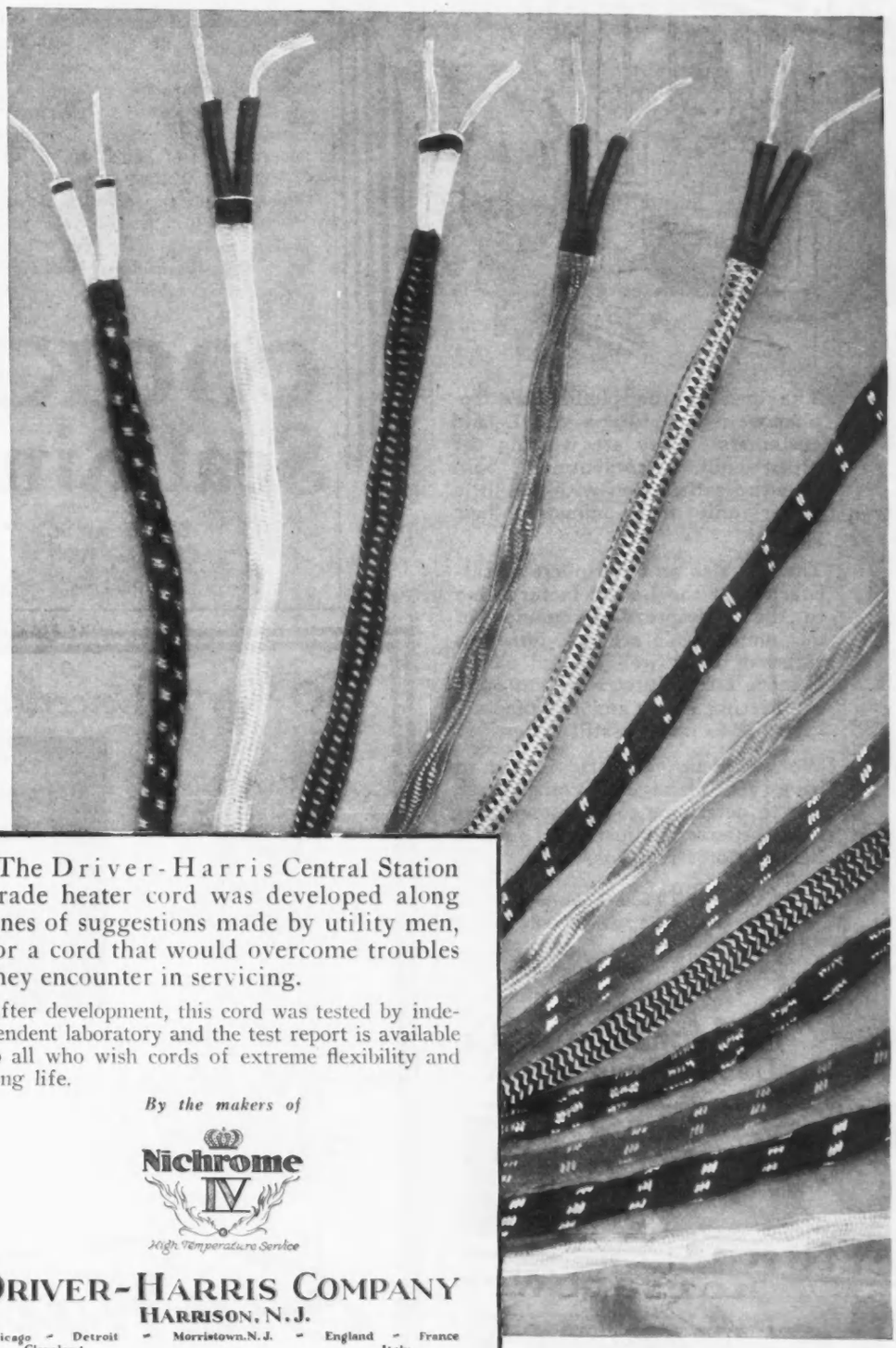

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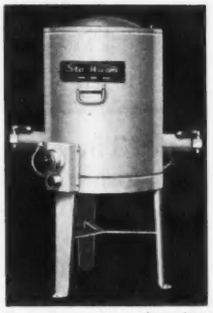

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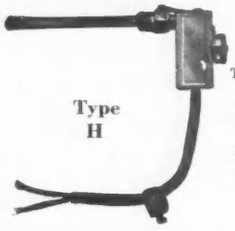

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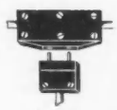

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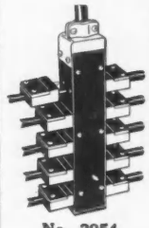

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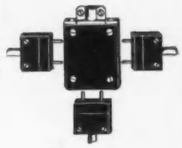

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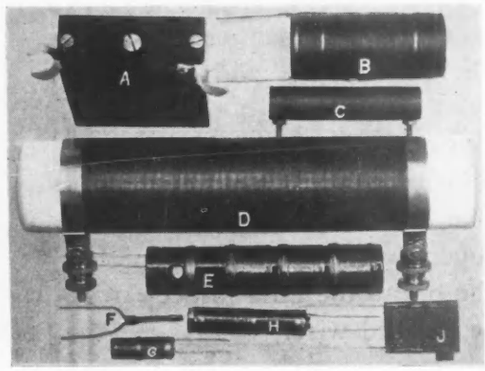

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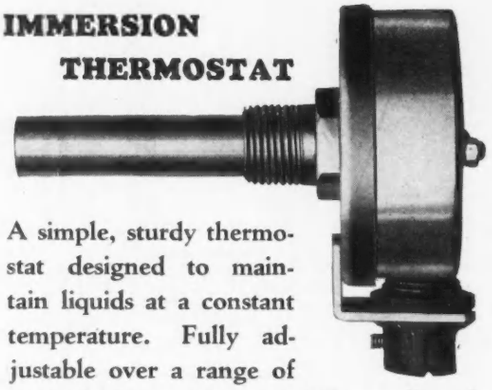

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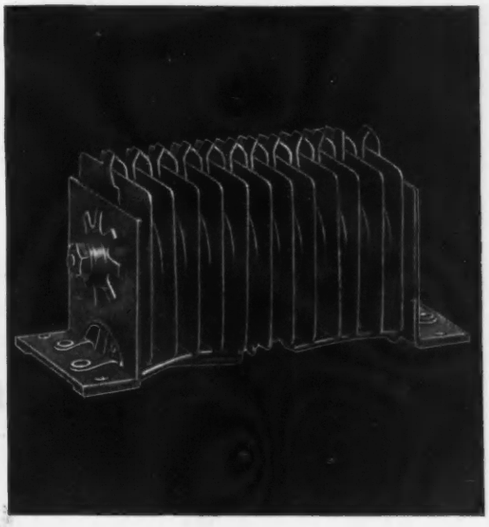

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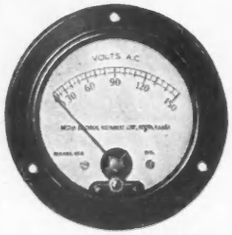

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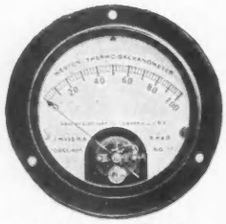

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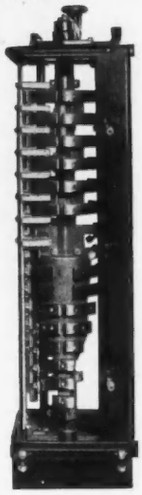

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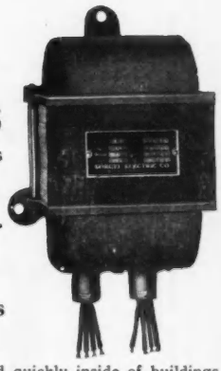

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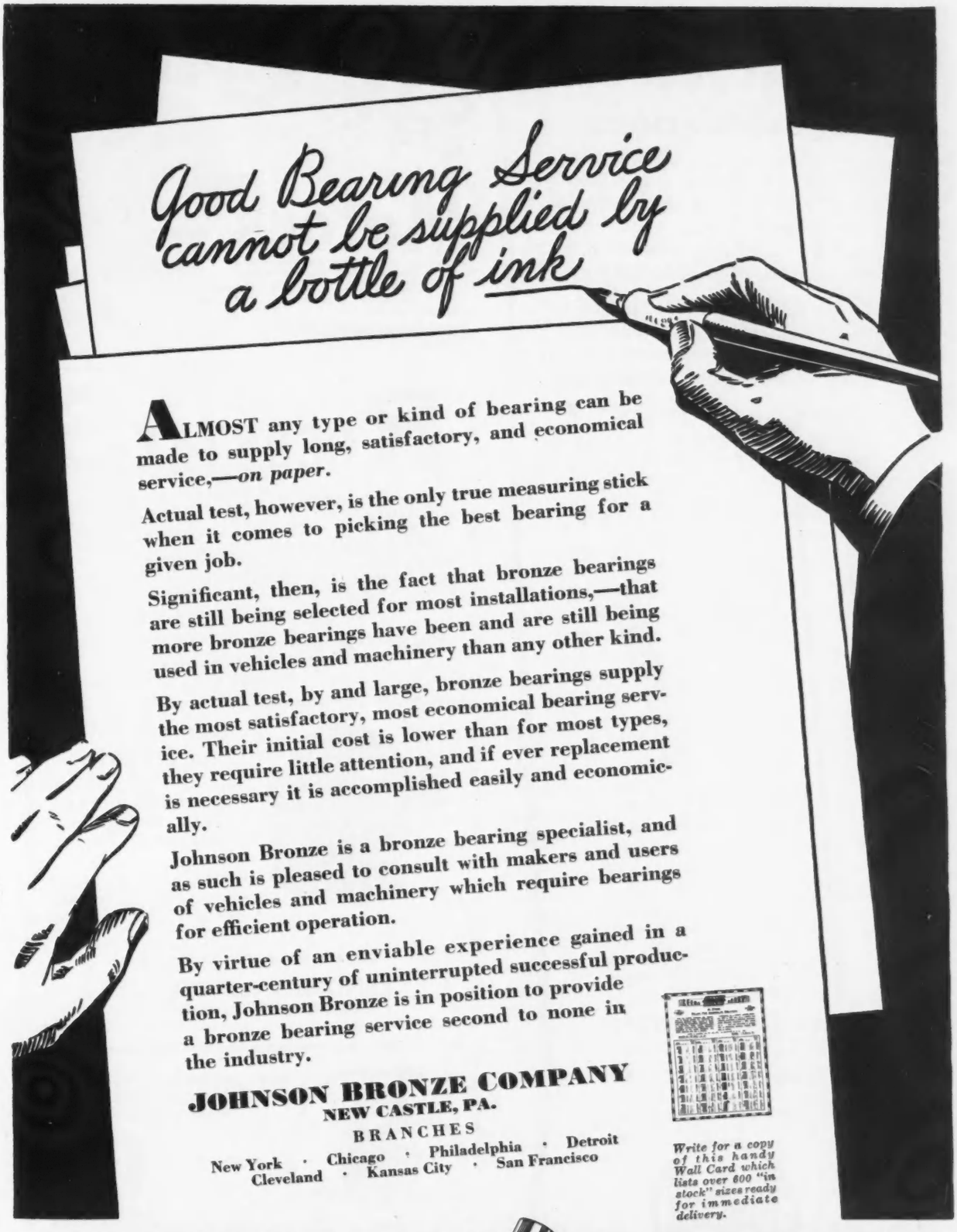

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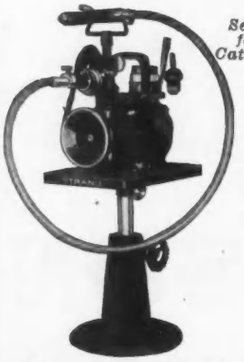

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Section I-2310 _____

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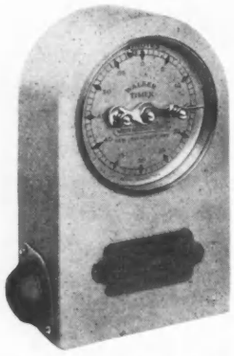
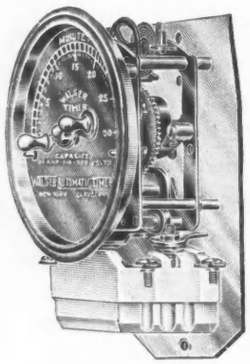


Twenty ampere dial and pointer control

WALSER

Automatic Timers



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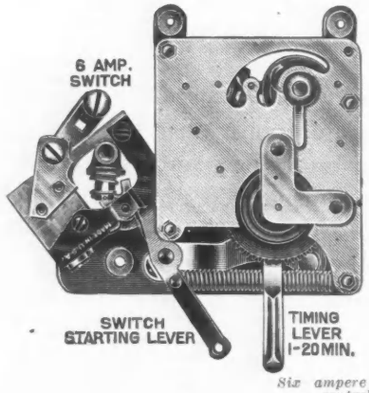

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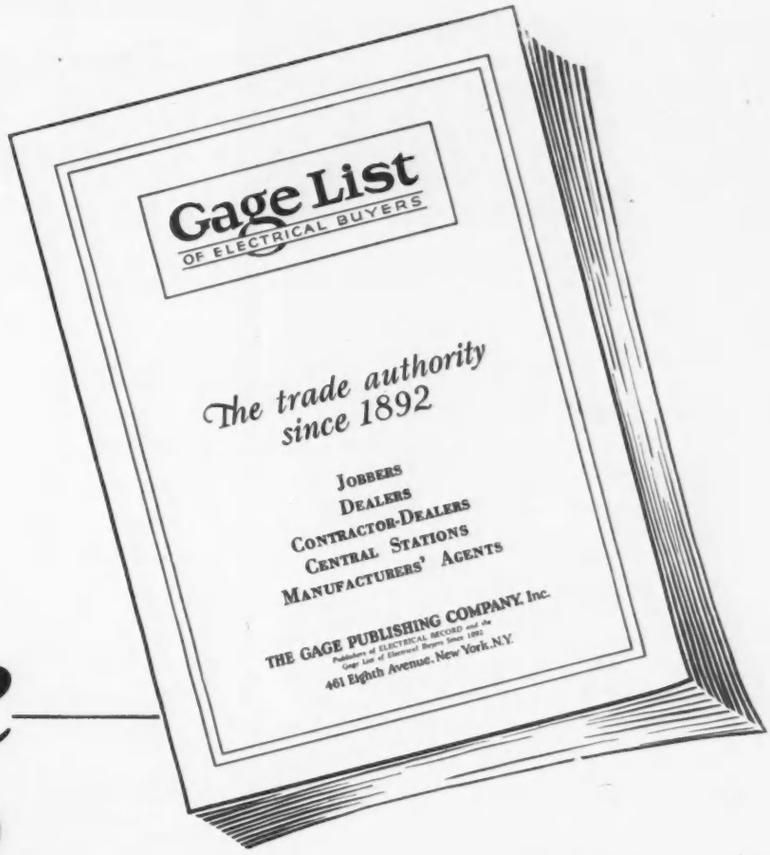

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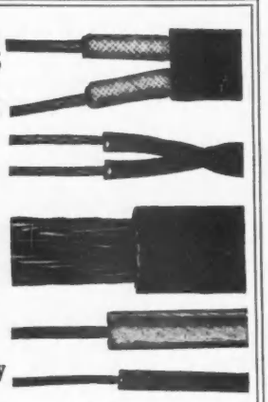

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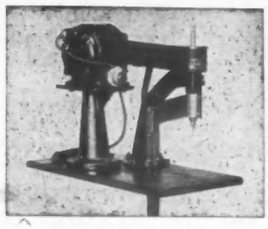

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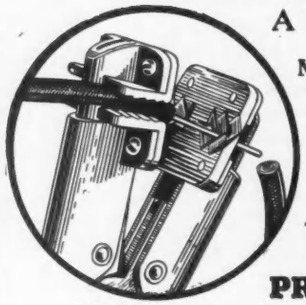

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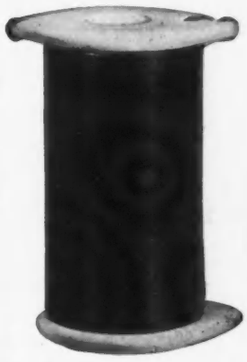

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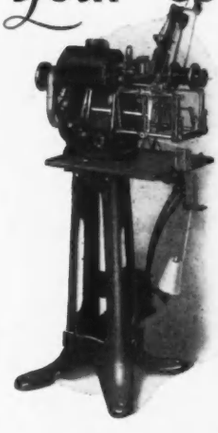

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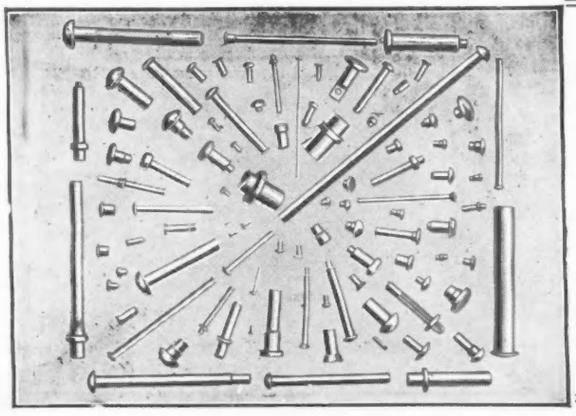

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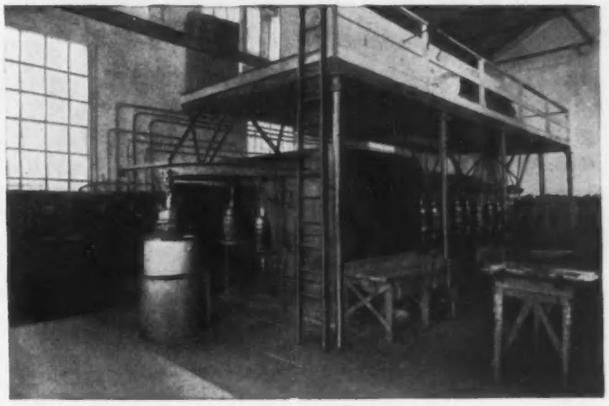

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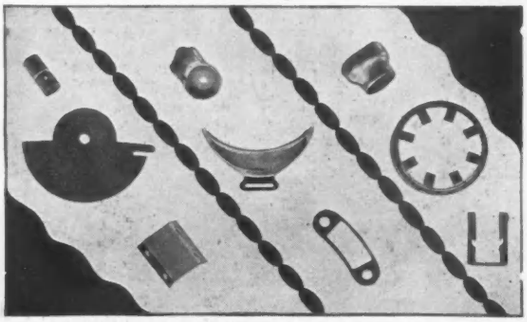

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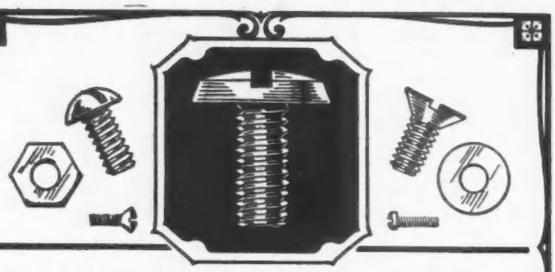

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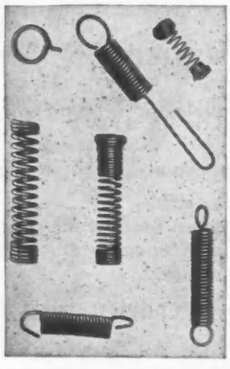

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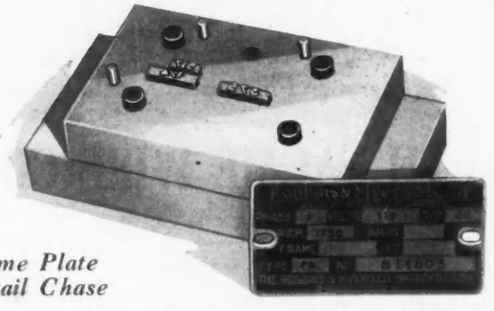

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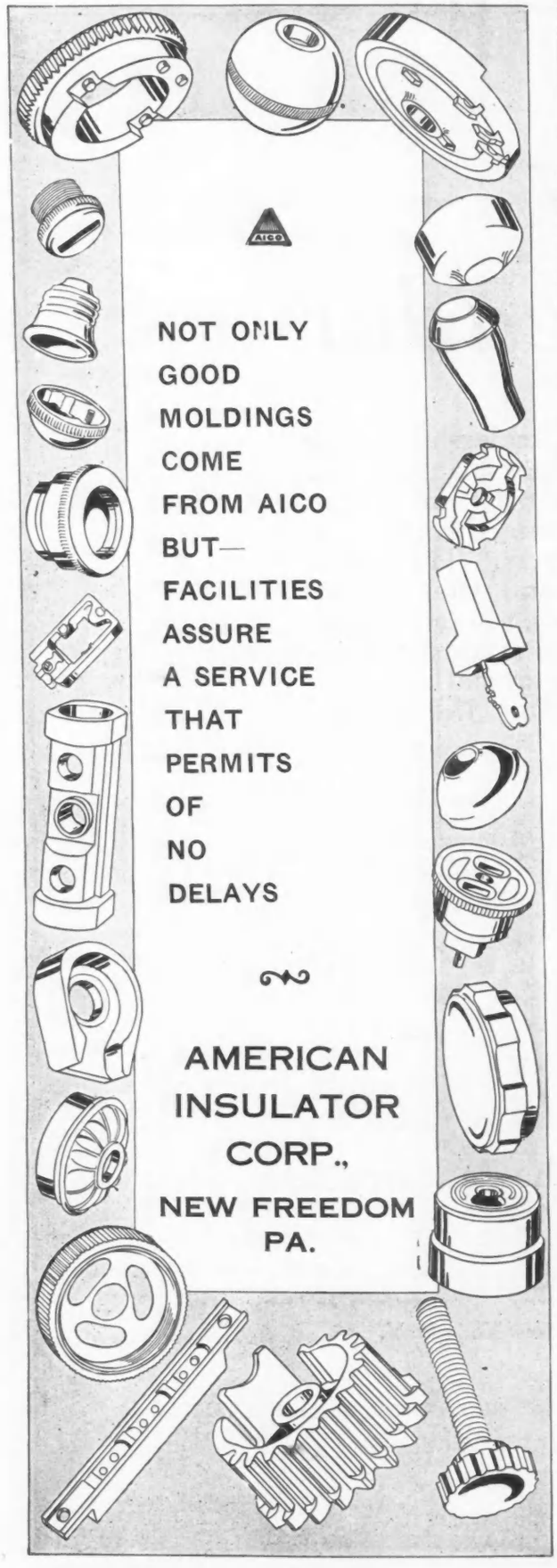

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